AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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New Engine Lathe.

The continued demand for machine tools has been the means of stimulating efforts, on the part of the manufacturers, to produce a tool that shall be capable of doing the greatest possible quantity of work in the shortest possible time, and in a superior manner. The lathe represented by the first engraving upon this page represents a machine designed to fulfill the above conditions. It has a very strong substantial bed, supported by heavy legs.

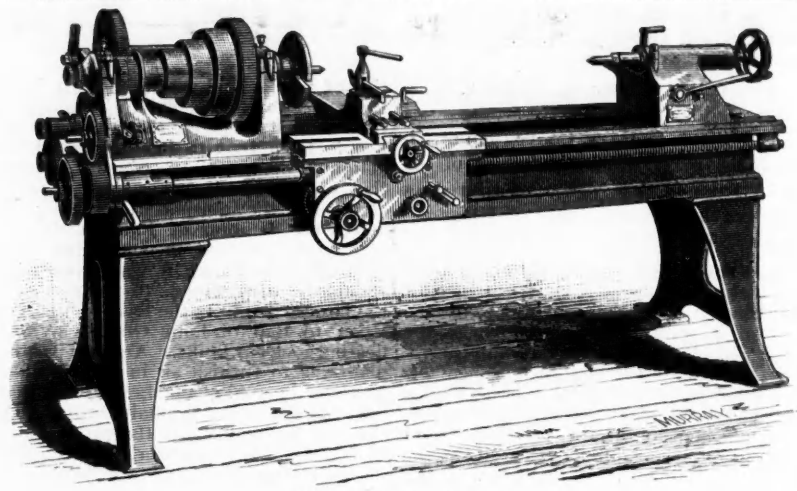
The cone has four changes of speed, is of large diameter, and is strongly back-geared. The spindle is of hammered steel, with bearings of large diameter and of unusual length. The carriage is designed for stiffness to carry a smooth heavy cut, and has slots for holding work. An independent cross feed is attached to the carriage.

While using the cross feed the carriage is firmly held in position by means of a clamp at the back, and operated by the handle shown in the engraving.

The threads of the leading screw are exempt from wear, except when cutting screws. The feed motion is accomplished by means of a splined gear, which slides the length of the screw. This screw operates the cross feed by means of a worm and wheel, and is thrown in or out of gear by a friction wheel. For screw cutting, two gauge screws are attached to the tool saddle.

When a number of screws are to be cut of the same size, after the proper size has been cut, one of the gauge screws is permanently set to the size required, and the other used in cutting down to the proper size. The train of feed gears is entirely independent of those used for screw cutting.

A clutch pin in the end of the leading screw engages with either set, or allows the screw to remain idle at the will of the operator. Changes in the gearing are readily effected by sliding the intermediate gear upon a pin, so as to engage different sets of wheels. The gearing may be reversed or entirely disconnected from the spindle, by a simple and convenient mechanism. The tail stock may be clamped in any position by means of a special cam, and the heaviest cuts may be taken upon work requiring the full swing of the lathe, which is uniformly sixteen inches. This lathe can be manipulated with perfect ease for light work, and the bed can be made of any desired length. They are made at the Bridgeport Machine Tool Works, Bridgeport, Conn., and sold by E. P. Bullard, 14 Dey St., New York City.

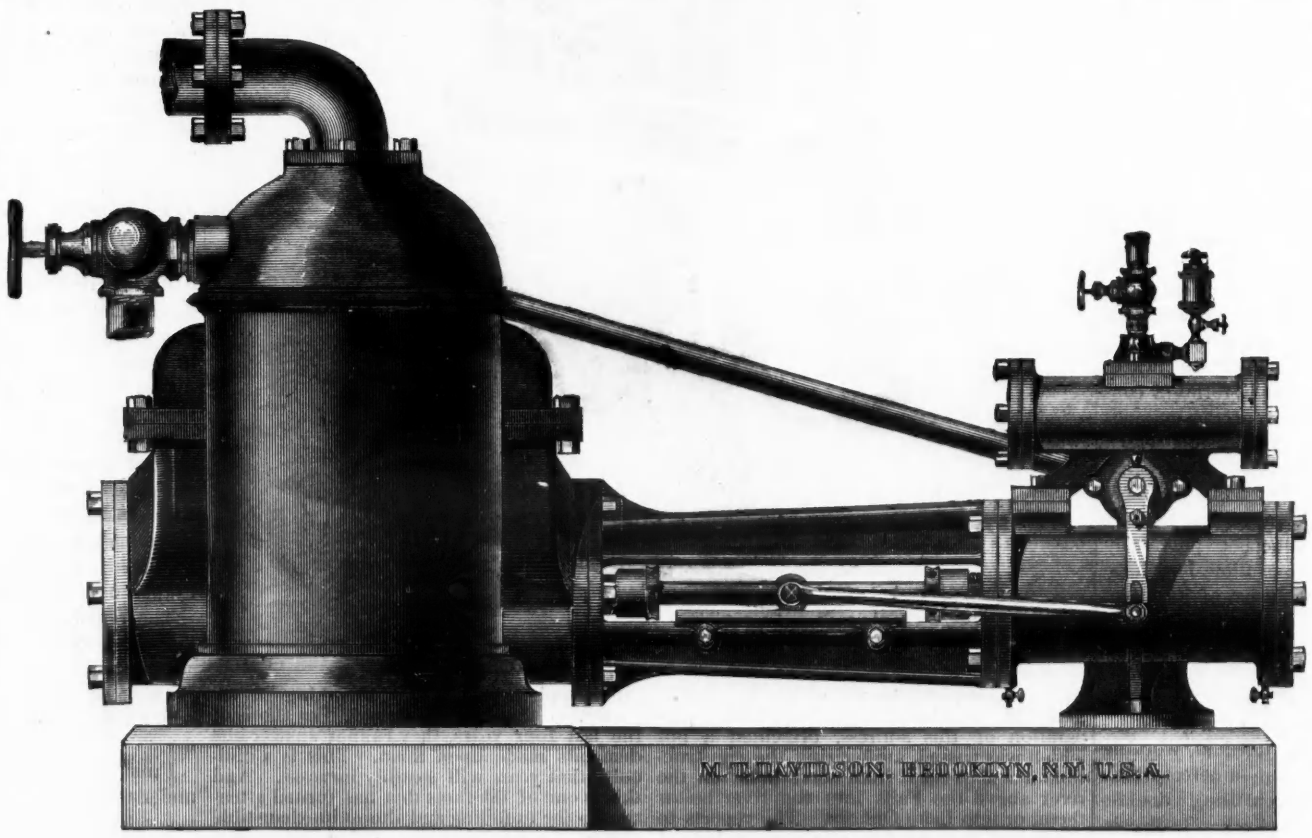


NEW ENGINE LATHE.

The Davidson Independent Steam Pump and Condenser.

It is well known that one of the principal factors in determining the power of a steam engine is the effective pressure that can be exerted against the piston. The piston, when in motion, is situated between two forces, one of which tends to move it along in the direction of its travel, and the other to retard its motion. Thus in a non-condensing engine the steam pressure against one side of the piston is resisted by the atmospheric pressure against the other side, and the effective pressure is the difference between the two; hence any means that can be employed to remove the pressure of the atmosphere will have the same effect as increasing the steam pressure to the extent of the pressure thus removed. This would result in more work being done with the same quantity of steam, or, what would be the same in point of economy, a less quantity of steam will do the same work.

The most common plan for removing the atmospheric pressure has been by the use of the air pump driven by an eccentric or an equivalent device, and by the intervention of levers and other connections, thereby making it a part of the engine and in all respects subject to its motion, and absorbing a portion of its power.



THE DAVIDSON INDEPENDENT STEAM PUMP AND CONDENSER

Any one familiar with the use of a pump thus driven is aware that they have some objectionable features, which have to a great extent been instrumental in determining the use of a large number of non-condensing engines, notwithstanding their inferior economy as compared with the condensing engine.

The desire of late to secure the economy of a condensing engine, together with the prejudice against the air pump driven by the engine, have led to the use of independent pumps and condensers, for which many advantages are claimed, some of which may be explained by a comparison of the two plans. In designing a condensing engine of medium size it is customary to allow five per cent. of the power of the engine to be used in driving the air pump; so that to get 100 horse-power from the engine it is necessary to construct it to develop 105 horse-power. With the independent air pump, since none of the power of the engine is used to run it, it is justly claimed that the cost of constructing the extra five horse-power is saved, and, further, that the power necessary to operate it being directly exerted by the piston instead of through an eccentric, crank, lever or other friction-creating devices, is no more than two-fifths as much.

Another fact worthy of consideration is that an air pump, driven direct from the shaft, must either have a capacity sufficient to take care of the water necessary to condense the steam in the summer, with the injection water at a temperature of 70°, in which case it will be much larger than is required in the winter, when the water is at a temperature of 40°, or it must be somewhat too small in the summer, and hence not so much too large in the winter. In the first instance it costs too much to run the pump in the winter, and in the second there is a loss from a poor vacuum in the summer. In like manner, when but little work is being done by the engine, and consequently but little water required to condense the steam, the pump capacity being in excess of that required, will absorb a larger per cent. of the total power exerted by the engine than it ought to, or if modified to suit this condition, there will be a loss of effect when the engine is heavily loaded.

With the independent pump, it is evident that whatever the variation in the quantity of injection water required for condensation — that is, if it is much in summer, and with heavy loads, or little in winter, and with light loads, the pump can be run just fast enough to keep the condenser clear, and hence the steam required to operate it will be at all times proportioned to the work being done in the engine cylinder.

Further: In setting the ordinary air pump, its position within very narrow limits is governed by arbitrary conditions, which frequently bring about its location in places of especial inconvenience, or where the room cannot be well spared; while in any event a substantial foundation must be prepared.

A properly constructed independent air pump and condenser may be set in the most

convenient situation, or where it will be the least in the way, and requires no extra foundation, but may be placed anywhere that an ordinary feed pump can be placed.

This feature renders the conversion of non-condensing engines, which are already placed and in operation, into condensing engines (by the use of the independent pump and condenser) a simple matter, and it would seem probable that in the future they will be largely used for this purpose.

While the foregoing considerations apply to engines running at ordinary speeds, there is in the high speed engines coming into extended use an additional argument in favor of the use of the independent pump and condenser. In such engines the speed is generally so great as to preclude the use of an air pump at an equal number of strokes, and since the independent pump may be ample at a convenient speed for the work required, the speed at which the engine is run is quite immaterial. Another valuable feature of the independent pump and condenser is that they may be started up and the vacuum formed in the condenser before the engine is started, thus getting the benefit of the vacuum in starting the engine, and relieving the engineer of managing an injection cock, starting bar and throttle valve at the same time. Also, if occasion requires, that the engine be stopped and started during the running time; no attention whatever need be paid to the vacuum or injection water, the pump being left to run without reference to stopping and starting the engine.

The independent air pump and condenser herewith illustrated, was designed with especial reference to, and a practical knowledge of the foregoing facts, and possesses many features worthy of consideration.

The steam end of the pump is the same in its general features as the corresponding end of the Davidson steam pump, illustrated and described in our issue of Aug. 6, 1881, while the water end is modified to suit the requirements of an air pump. The condenser, which does not differ materially from an ordinary jet condenser of good construction, is bolted to one side of the water and air cylinder, while for convenience and symmetry the discharge pipe is bolted to the other side.

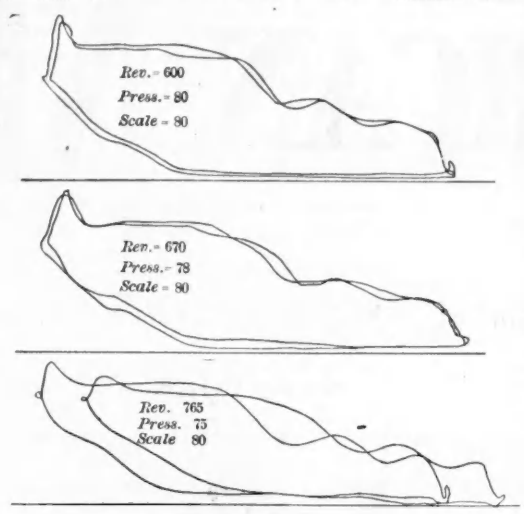
Into this condenser the exhaust steam from one *or more* engines, and also from the pump itself, is taken; the pump operating to relieve the condenser of air and water, with the exception which will be referred to, the same as the ordinary double-acting air pump. The exception just mentioned is brought about by a peculiar construction of the pump cylinder and piston, which is as follows: In the center of the cylinder, longitudinally, is a port extending circumferentially nearly one-half around it, and which forms a connection between the interior of the cylinder and the condenser. The pump piston, which is made of bronze, grooved for water packing, and fitted with a packing ring, similarly grooved, is in length equal to one-half its stroke, less the width of the port previously described. From this description, it will be seen that, just at the conclusion of its stroke in either direction, the piston will uncover this port, thereby alternately connecting each end of the cylinder with the condenser, and establishing an equilibrium of pressure between the two. The object of this arrangement is to prevent the unequal working of the two ends of the pump—a defect which has kept many engineers from using a double-acting air pump, and caused others to discontinue their use after trial.

While, as just stated, the prime object of the arrangement described is to constantly restore the equilibrium between the two ends of the pump cylinder and the condenser, which is liable at all times to be disturbed by unequal action of the pump valves, and which can never be exactly established through the valves, it incidentally affords an extra and certain passage for the water and vapor from the condenser to the pump. The location of this port in the cylinder, with reference to the condenser, is such that, while a portion of it may be occupied by water passing through it, there will be a portion not thus occupied, and through which the vapor may pass in the direction necessary to establish the equilibrium.

The valves, and, in fact, all parts of this pump, are simple and easy of access, and it may be set up and operated by any one competent to set up and connect an ordinary feed pump.

In general design it is neat and tasty, which, together with the fact that it is nearly noiseless in its operation, render its presence in any engine room entirely unobjectionable.

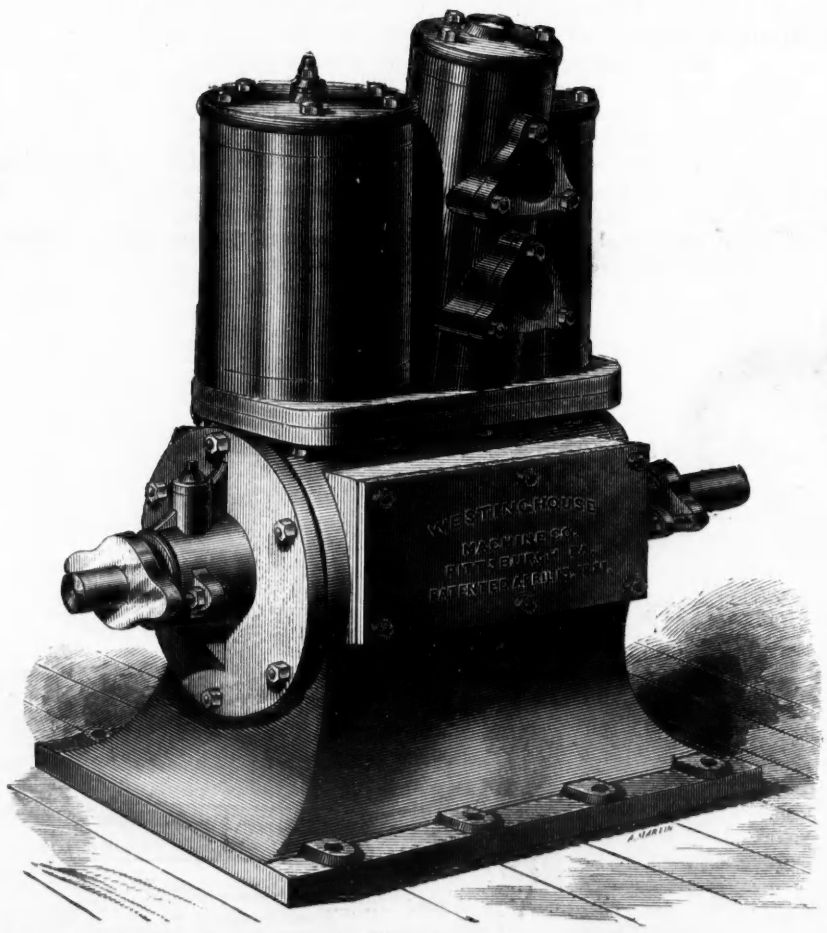
These independent air pumps and condensers are made by the Davidson Steam Pump Co., 41 to 47 Keap Street, Brooklyn, N. Y.



The Water Power of Niagara.

At the recent Bankers' Convention at Niagara Falls, F. R. Delano, Cashier of the Cataract Bank of that village, delivered an address on the "Water Power of Niagara," closing as follows:

It may not be inappropriate to mention a plan which was matured some years since for establishing a second Manchester in the county of Niagara. It was known as the Niagara Ship Canal project, and was the revival of a similar one which had been entertained some years before, and for which a survey had been make by authority of the War Department by the United States Topographical Engineers, under the charge of Capt. W. G. Williams. In 1853 Mr. G. W. Holley, then a member of the Legislature from Niagara, and to whom the speaker is indebted for valuable assistance in the preparation of this address, presented a bill which was passed, authorizing the construction of a ship canal from some point on the river above the Falls into the river below them, or into Lake Ontario. The reports to the Canadian authorities of the operations of the Welland Canal, for some years previous to that date, showed that three-fourths of the business of that canal was done by Americans, and there was a strong desire manifested that a ship canal should be constructed on the American side of the river, which would be much shorter and more safely navigated than the long Welland Canal. The idea was so favorably received and supported by individual capitalists and by friends and officers of the Government, especially by Congressional representatives in the United States Congress from the Western and Northwestern States, that a bill, with liberal provisions, authorizing the work, was passed by a large majority of both branches of the Legislature of the State of New York. There was also a reasonable prospect that a donation of public land would be made in aid of the project. But the exciting political questions which engaged the attention of the people from 1854 to 1860 prevented further action on the question. Since it is supposed that Captain Eads has started a new idea concerning the transportation of ships by rail across the Isthmus of Panama, it may be mentioned here that, in connection with the Niagara Ship Canal, it was proposed, if it should be constructed, to transfer ships of the largest size from the level of the Niagara River to that of Lake Ontario by rail, in floating locks or tanks. Another part of the plan was to furnish an inexhaustible water power to be used at the Lewiston Ridge, below which a city of fountains was to be built. It is not impossible that the project may yet be consummated as a work of necessity, for the following reason, if for no other, namely: that all the great water courses, east of the Mississippi, are gradually shrinking in capacity, so that in dry seasons, like those of the last four years, they cannot answer the demands made upon them. This is a difficulty that years will steadily increase. And this is one of the facts that has turned attention to the unfailing and almost inexhaustible power of the Niagara. Other prominent facts are the following: 1st. That there are some branches of manufacture that require a power so great, so uniform, and so easily controlled, that for them no other known method of producing force can be economically used. 2d. That water power is the least expensive power now known; that when it is taken from the deep basins or reservoirs through deep channels, as it must be from the Niagara River, it never freezes, never explodes, never wears out, never decays or rots, never shirks, never goes to sleep, is never spasmodic or unequal in its motion, costs nothing when it is idle, or not in use, requires no delay to bring it into action, but responds instantly and with full force the moment its action is required. Finally, it is a means of protection against fire, diminishing the risks of destruction and the rates of insurance, and is the strongest, safest, steadiest force we now control.



THE WESTINGHOUSE HIGH SPEED ENGINE.

To keep his neighbors' cattle out of his fields an ingenious farmer stuck a few nails through a clothes line. A shrewd man saw this device, and soon afterward patented the "barbed wire" fence. The farmer from whom he got the suggestion now pays him tribute, and the income of the manufacturer is said to be about $100,000 a month.—*Syracuse Evening Herald.*

Westinghouse High Speed Steam Engine.

The new high-speed steam engine, represented by the accompanying engraving, consists of two vertical inverted cylinders, containing pistons, which are attached by means of connecting rods to cranks placed diametrically opposite. By admitting steam to one cylinder its piston is forced down, thus transmitting power to its crank, and by the same operation returning the piston of the other cylinder to the highest point of its stroke. Steam is then admitted to the second cylinder and exhausted from the first. It will therefore be readily observed that the effect of gravity and steam pressure is to constantly keep the bearing surfaces of the connecting rods and cranks in contact. The same forces are exerted to keep the main shaft upon its bearings throughout its complete revolution. This arrangement makes adjustment for lost motion unnecessary, the reciprocating parts being always compressed.

In consequence of this, all bearing parts can be entirely worn away, without requiring adjustment to prevent pounding.

The distribution of steam is effected in the Westinghouse engine by means of a piston valve, placed between the two cylinders and driven directly by an eccentric located upon the main shaft, between the cranks. Steam is admitted between the pistons of this valve and exhausted at the ends, thereby making it perfectly balanced. This valve, in addition to being made of chilled iron and ground to size, is also provided with packing rings, which compensate for any wear either in the valve or its seat. By the use of an annular exhaust port, which is so arranged as to be uncovered by the main piston during the last half-inch of its stroke, the waste room or clearance is greatly reduced, those engines depending entirely upon ports from steam chest to cylinder for both steam admission and exhaust—the annular exhaust referred to much more than compensating for the reduction in size of steam ports.

By referring to the engraving it will be observed that the moving parts are contained in a casing which is partially filled with a lubricant which protects them from dust and dirt of all kinds. At each revolution, all of the revolving parts are immersed, and by a simple device the upper ends of the connecting and eccentric rods receive a supply from the same source. A plain form of cast iron ring is used as packing for both piston and valve. These rings are so proportioned that, while perfectly steam tight, the friction due to their use is inappreciable.

The remaining part requiring packing is the valve rod, which is subject to exhaust steam pressure only. This is done by placing a small piston with a ring on the stem which runs through a sleeve or small cylinder.

From the foregoing description, it will be understood that this engine does not differ in general principle from other single-acting engines heretofore made, and possesses all the important advantages of this construction. In the matter of form and detail, however, valuable features have been introduced, which, it is believed, constitute a mechanical combination among the best kind for using steam to furnish power.

In the important feature of steam economy it is claimed that no sacrifice has been made, results having been obtained that make this rank with the most efficient modern engines, in regard to reliability and low cost of repairs. In this engine heated journals, caused by too close adjustment or want of proper lubrication, are entirely avoided.

This point of excellence has been thoroughly proved by actual experiment upon a newly completed engine, which ran at a speed of 780 revolutions per minute, delivering 18 horse power for 8 consecutive hours. The test mentioned is not an exceptional one as all engines of this class are subjected to a similar test before leaving the factory.

The accompanying indicator cards were taken from a 7″×5″ Westinghouse engine at different speeds. The cards from both cylinders were taken upon the same paper. This engine is capable of running at an extremely high speed when necessary, as all the working parts are perfectly balanced. It is very compact, as an engine to develop 40 actual horse-power occupies a floor space of 22″×36″, including fly wheel, and stands 40″ high over all.

The journals are all hardened where they possibly can be, and are very carefully fitted. The eccentric strap is the only part that requires adjustment; but as it runs in clean oil and drives a valve which requires but little power, very little wear is the result. There are no piston or valve rods to require packing. The light weight of this engine in comparison to its power, together with its general construction, render a large foundation unnecessary.

A skilled attendant is not required to run this engine, as all the care required is to turn on and shut off steam, and fill the valve lubricator twice a day.

It is not claimed that an excessively high speed is the most economical; but there is a point where the losses due to friction of belts and shafting may be more than compensated for by a slight loss in the engine due to the high speed. One of these advantages may be realized in driving dynamo machines for electric lighting, where compactness, power and speed are the principal considerations.

The parts of this engine are all made to a gauge, and are interchangeable.

It is built by the Westinghouse Machine Company, Liberty Avenue, 24th and 25th Streets, Pittsburgh, Pa.

German Exhibition Notes.*

The Allgemeinen Deutschen Patent und Musterschutz Ausstellung (General German Patent and Patent Model Exhibition), was officially opened on the 10th of May last, but was really not finished and in working order until the 15th of June. In its youth it suffered all the trials and adversities of the unfortunate World's Fair in New York. At first intended for an exhibition of the patents and models on record in the Patent Office here, it has finally, after many changes of management and much squabbling, become a general exhibition, and not, as its name would imply, a patent exhibition, developing, unlike the New York enterprise, however, into a gratifying success so far.

The main hall, as you will see from the sketch I send (see cut), is semi-circular, to which are added seven octagonal attachments. The whole occupies a space of about 130,000 square meters (a meter is 39¼ inches), and here are exhibited all the different industries of Germany, France, Belgium, Holland, Austria and England. The three first countries, however, are very much the best represented. America, I am sorry to say, is but poorly represented comparatively. This is owing to a want of proper announcement beforehand, the American Machinist being the only paper that noticed it, and then too late to be of service. The entire grounds are about three-quarters of a mile long by half a mile wide, and just on the outskirts of Frankfort, which is acknowledged to be one of the most beautifully-situated cities in Germany—I may, perhaps, say Europe. The Exhibition is situated on a beautiful plain, reaching almost to the very base of the highest mountains in the famous Taunus range. In these mountains most of the natural mineral waters in Europe are found, and most of the mineral baths are built, such as Wiesbaden, Homburg, etc. What was last February a mere piece of flat ground, has been now made to look like a perfect Paradise of flowers, lakes, fountains and (I might as well say it, even at the risk of robbing the picture I was going to give you of its romance) bier halls. Of the latter there are all sorts of styles, the old German, the Rhenish Weinstube or drinking hall; and in fact, you can drink beer and wine in any language or fashion you choose, from the time of Herman the Great down to the present day. The main points of interest outside the main hall are the machinery hall, the balneologie, or exhibition of mineral waters and apparatus, etc. (in fact, every thing connected with the present system of using and exporting the different mineral waters here, from the water itself to cutting the corks for bottling it); the art gallery, which is very fine; the skating rink (which is of natural ice, the ice being now 3″ thick over the entire space, 39 meters by 14 meters, and is to be 1½″ thicker, and will probably be ready next week); the electric railway and electric elevator from Messrs. Siemens & Halske, and the electric light the American electric lighting system, represented by H. G. Mochring, Esq., of Frankfort (in fact, Mr. Mochring is about the only American exhibitor here), and Messrs. Siemens & Halske, of Berlin.

Patent and Patent Model Exhibition at Frankfort-on-the-Main.

By way of explanation of the sketch I will state that the main hall is shown at the extreme left. The balneologie appears at the extreme right. The water tower for reservoirs, to which an electric elevator is attached, is shown in the distance between the main hall and the horticultural hall, the latter, together with the grounds laid out in front, appearing in the distance near the extreme right. The large building in the foreground of the picture is the skating rink. The Imperial reception chamber is shown near the fountain in front of the main hall. A covered way shown near the foreground extends from the portal to the main hall. The artificial lake is shown in the foreground a little to left of the center of the picture. The Taunus mountains appear in the distance.

The electric light was one thing that caused the greatest interest among the spectators the first evening it started, and ventures and hazards were made on all sides as to what the result would be. You must understand, to fully comprehend this feeling on the part of the German public, that the electric light is not known and used here as it is in New York and other American cities. Up to the present time the Siemens light was the only one known popularly; there are some few Jablockoff, and a few Gramme machines used, but the greater number were Siemens. It is therefore with no little pride that I announce to you that the American light (Weston system) has made a most triumphant success over the Siemens. The grounds and restaurants all over the place are brilliantly lighted every night. The Kaiser has sent his private orchestra with his band master here, giving us the best music in Germany every afternoon and evening.

Besides what I have already mentioned, there is a magnificent horticultural exhibition attached.

I had forgotten to state that in the main hall there are 1,150 exhibitors, and in the whole exhibition there are 2,500. The Machinery Hall is not, to an American at least, proportionately large.

There are four boilers of different patterns to furnish steam for three engines, representing about 250 H P. and driving a line shafting of 100 meters. This is not calculating the shafting inside the main hall erected by private parties. There are 3,000 meters of steam pipe laid up to the present time. This is only for motive power; there are, besides this, 15 Otto Gas Motors ranging from ½ to 10 H. P.

With these details I hope you will be able to show your readers that at least there is an exhibition in Frankfort, which only through bad management they have hardly heard of before.

I, to-day, received your issue of August 13th. It somewhat surprises the natives here to find that I receive the paper every week on about the same day it is published in New York.

If it will be interesting, or in any way comforting to your readers, I might say, that this afternoon, and yesterday also, the thermometer indicated 104° F. in the shade, with not the faintest suspicion of a breeze.

* An American now resident in Germany, who is engaged in introducing American mechanical specialties into that country, sends us these Exhibition Notes, under date of Frankfort-on-the-Main, August 9th. His description and the engraving will give our readers an idea of the German method of conducting industrial exhibitions.

The new metal in which it is proposed to construct pipes in which to lay telegraph wires underground is described as very light—only about one-sixth the weight of iron—and, being composed almost entirely of pure carbon, is indestructible. Whether in the air or underground, it does not rust or change by exposure, and is not affected by heat or frost. The most important characteristic claimed for it, however, in connection with underground wires, is its being a perfect insulator. The pipes of the metal need not, it is stated, be buried very deep in the ground, as they may be of a semi-elastic character, adjusting themselves to the slight upheaval and depression of the ground through the action of frost.

Recent and Needed Railroad Inventions.

It has sometimes been intimated that railroad employes are not infrequently saddled with too many and divers duties to insure the proper attention to the more important of them. However this may be as a matter of fact, our German friends do not seem to look upon it in that light, since, in addition to his other duties, the conductor on German railways carries around a fully-equipped printing office, and prints the tickets for his passengers as they may require them. One particularly valuable feature of the press which he uses is that it reads its own proof, and immediately proceeds to kick up a row if the job is not clean. The invention has one serious drawback, which is that the conductor, in his capacity as editor—since he is at the same time compositor and pressman, as well as principal contributor and general distributing clerk—has rather limited openings for finding fault around the establishment.

The opportunities for adding to the literature of the Patent Office, in preparing the specifications for this patent, must have been something immense, and, no doubt, were fully improved. The average patent solicitor will get up fairly high-sounding claims on reasonably small capital; but give him a possible combination of a live railroad conductor, a fully-equipped printing office, and an automatic proof reader, and corresponding results may confidently be expected.

One more invention is needed to reduce the running of railroad passenger trains to a close corporation basis. That is a portable machine and blacksmith shop, adapted to be attached to the engineer, so that by the assistance of the fireman he could do the repairs on his engine between stations. If to this were added a packing machine, capable of seating 250 persons in 100 seats, but little more would be needed.

The *Zeitung des Vereins Deutscher Eisenbahnenverwaltungen* (Berlin) gives particulars of the conditions under which the International Tramway Locomotive competition took place at Arnheim, in April and May of the present year. During the trial each locomotive was required to conduct the ordinary traffic for one day, the consumption of water, coke, oil, etc., being under strict supervision. In addition to this, an official trial trip was made with each engine, drawing three tram cars loaded with bags of sand, giving a total weight of 10 tons. Four engines were entered for the competition, that of Krauss & Co., of Munich, obtaining the prize. This engine consumed on the trial trip of 33 miles 373 lbs. of coke, and 2½ lbs. of lubricant.—*Engineering.*

One by one the things that we have been taught to believe turn out fallacies. It has long been considered settled that plants, and similar products of the soil, required, in common with mankind, a portion of the twenty-four hours in which to rest; but Dr. Siemens has demonstrated that by the use of the electric light vegetables can be brought to maturity in one-half the usual time, and at the same time have their flaver improved. In other words continue in good health. Hereafter we may expect to hear of electrical Grangers, and to be regaled with dynamo-electric potatoes and cabbage. It only remains to be shown that under the influence of an electric light that shall abolish night, man will require no sleep.

Feeding and Shrinkage of Melted Iron.

By Thos. D. West.

The assertion often made by writers, "that melted cast iron expands at the moment of solidification, so as to copy exactly every line of the mould into which it is poured," always sounded to me very absurd. The word "moment" would imply a sudden dividing line between liquid and solid iron. In melting iron, there is nothing sudden from the time it leaves the melter's hands till it is tapped out into a ladle, from which time it cools gradually, the time it will take to cool depending on the shape and size of the mould that the iron is poured into. The amount of expansion or shrinkage will be according to the grade of softness or hardness of the iron, and the quality of the ores that the iron is made from.

Soft iron is often grained, and when melted has more life than hard iron, and may expand some in cooling. Hard iron is close grained, melts quicker, and has more shrinkage than soft iron. Take two solid pieces, three inches square, and pour one with hard iron and the other with soft iron, and have the same sized feeding heads and gates on both, and do not feed either of them; and in the morning, when you break off the heads, you will find the one of soft iron solid, and the one of hard iron, ten chances to one, will have a hole in it. If not seen on the face, cut the casting in two pieces, and you will likely find it honeycombed under the skin, especially if the iron was poured hot. Melted iron, when cooling, cools the fastest at the bottom of the mould and at the sides and cope surfaces, which draws molten iron from the hottest or central portion to supply the shrinkage of the cooling parts. If this central, or last portion of the iron that cools, is not reached with a feeding rod and hot iron to supply the shrinkage, the last parts to cool will be honeycombed or hollow.

There are often castings that cause explosions or breaks through the thickest, and, as is thought, the strongest parts. One cause for this is that there is not one moulder in fifty who feeds a casting in the right manner, or who studies the parts that require feeding. There are often castings that would require a half dozen feeding heads to make all the parts solid, and in some cases the designers of machinery or the pattern makers will have castings disproportional, so that the thick portions cannot be fed, or the shrinkage of the heavy parts supplied with iron. Such parts would be stronger if they were made lighter, and had what iron there was solid, rather than heavy, with a honeycombed center.

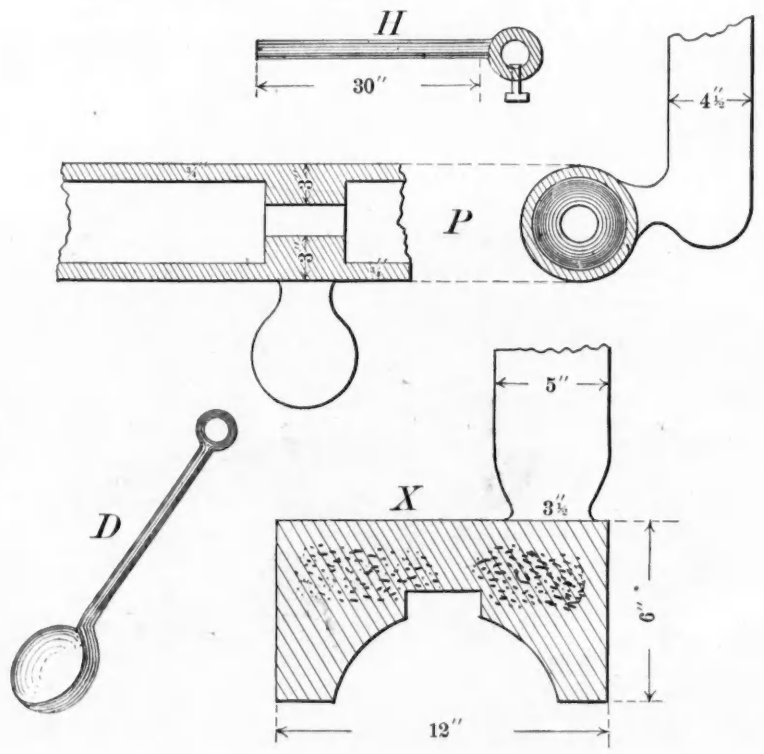
The cut *X* shows a round die block that was used in a lamp manufactory for pressing a composition of metal. There had been several of them made, but, being unsound, the pattern was taken to another shop, as it was very expensive to throw them away when partly turned up. When the pattern was shown to me and the trouble explained, the first question I asked was if there had been a large feeding head used, and if they were fed well? I was answered "Yes," Further questioning showed that there were no signs of dirt or holes until the casting had from $\frac{1}{8}$" to $\frac{1}{4}$" turned off it. I gave the job to a man I knew was not afraid of a hot job, and saw that he got hot iron when wanted. He stuck to it until his rod was driven up into the feeding head by solid frozen iron below it, and I had the pleasure of telling him that his casting was the best and solidest the machinist had ever finished up. What the machinist called dirt, or holes in the bad castings was only honeycombed or porous iron, caused by improper feeding.

In setting a feeding head on a pattern, it should, if possible, be set or cut on the thickest portion of the casting, or that part of it which will keep the longest hot. The feeding head should be of such size that it can be kept open, with hot iron, until the casting is set. In starting to feed a casting, the rod should be put in slow and easy, and if the mould is not too deep it should touch the bottom, and then be raised up two or three inches, so that it will not be punching holes in the mould. Some moulders, when feeding, work their rod up and down in the center, and the sides freeze up and close or solidify while the iron in the mould is yet in a liquid or molten state; or they will put a small feeder on, that will freeze so quickly that they cannot get a rod into it, or if they do it will stick fast, and then they will complain of some one for not bringing hot iron when wanted. A moulder should never make this excuse. He should have the feeding rod hot, and the head the right size; and instead of working the rod in the center, work it up and down around the sides quickly, so that the freezing iron will be pushed or worked down into the casting, and the hotter iron in the casting worked up into the feeding head. This keeps the head and casting at the same temperature.

When you do get hot iron, always have a hole worked in the head to hold as much as possible, so that it will help to cut away the freezing iron on the side of the head, making the iron in the head hotter than in the casting. Put in hot iron when there is a good chance to get it, and don't call for it just as you see the cupola man going to stop the cupola up, or do some other as sensible trick, as putting in the rod so that it does not go into the casting, which lets the neck of the until the iron in the casting commences to stick to the rod, then the moulder should give it all his attention, as the neck will close up if the feeding rod is not kept in constant motion; especially if the iron is hard.

I was at one time foreman of a shop where rolling mill work was done. The proprietor being a moulder, and knowing the failings of moulders, adopted a plan of feeding his large and small rolls a certain length of time. Rolls weighing about 4 tons he would only allow to be fed 70 minutes. It made no difference whether they were poured hot or dull. When the time was up the heads would be filled with hot iron and the rods worked to open the neck, then taken out and the iron covered with blacking. The plan was a good one so far as showing an outside solid appearance when turned up; but should the roll be broken, of the inside appearance I have nothing to say.

When a proprietor or foreman thinks that he has no men who understand, or who will stick to a hot job until the rod is driven out of the casting, the best and surest plan would be to make the feeding heads without a neck; that is, having the feeder the same size at the bottom as at the top. Then let the head be cut off in the lathe, as is done in the



feeder freeze. The rod should be kept down into the casting, and let the iron as it freezes at the bottom push it up out of the casting.

There are often cases where the iron or wooden bars of a flask will not admit of a proper sized feeder. In such cases where the bars cannot be readily widened, the feeder should be built up in length, to make up for the loss in diameter. A small feeder closes quicker and takes more hot iron to keep it open than a large one. Large feeding heads require less work and attention than small ones. With feeders 10" and upwards, as soon as the casting is poured put in the feeding rod and work it around for a minute or two to work the dirt up to the surface. Then take the iron dipper, as shown at *D*, of which a shop should have 3 or 4 sizes; the dished part being about 2" deep and the handles about 4 feet long; and dip out the dirt and as much of the dull iron as is necessary to make room for one or two hundred pounds of hot iron. Then work the rod to mix the hot and dull iron, and throw on some blacking to keep in the heat. After fastening on the holder *H*, or a pair of blacksmith's tongs to hold up the rod, the moulder can rest from ten to thirty minutes occasionally lifting up the rod to see how the iron is, and that it is not freezing at the smallest part or neck of the feeder. As soon as the neck shows signs of closing up work the rod around to open it and to mix the iron, after which dip out some of the dull iron and pour in some hot iron, and cover again with blacking. Repeat this operation

manufacture of cannon or large guns. In such work the gun is cast from 2 to 3 feet longer than wanted, the extra length answering for a feeding head.

In writing this article, the subjects chosen are castings that cause trouble from shrinkage, and are good ones to show the principle of feeding and shrinkage.

The cut *P* shows a broken pump, of the kind used on a locomotive; and when the castings were bored out they would be porous and dirty in the heavy section. To remedy this they were cast in dry sand, and on end, but with no better result. The thickness of iron on each side of the heavy part is only $\frac{3}{4}$", and the heavy part 3" thick. My attention was called to the job, and seeing the trouble I made two or three castings in green sand, and with a feeder cut into the heavy section, as shown. The casting bored out solid and clean. Casting them in dry sand, and on end, would not make the thick part sound, as the thin part would freeze before the thick, and the iron to supply the shrinkage would have to be withdrawn from the upper and hottest portion to supply the shrinkage below; so that in boring the heavy section, the part that was down would be solid, and the upper part porous or honeycombed.

I have often seen castings go out of the foundry that were required to stand heavy strains or pressures, which, if the party that received them had understood the feeding of melted iron and had seen them fed, would never have been accepted. It is not altogether ignorance on the part of the moulder, but the desire to get rid of a hard and hot job; that is the main cause of ill fed castings.

Car Spring Specifications.

The following are the specifications under which all springs used upon the different classes of cars of the Pennsylvania Railroad are made. Each spring upon being received at the Altoona shops, is proved by an application of the test prescribed in the specification, applying to that particular class of spring. The elliptic springs are classed as follows: "Single Elliptic," which signifies a single elliptic spring. "Double Elliptic," meaning two in a bundle. "Triple Eliptic," meaning three in a bundle, and "Quadruple Elliptic," meaning four in a bundle. B B signifies between bands. Auxiliary plates are two plates placed within each spring, so that the compressed spring will be relieved from the damaging action caused by the violent oscillations of a car in passing around curves. The ends of the auxiliary plates touch each other under these circumstances, and form a firm support for the springs.

Specification A.

40" Triple Elliptic Bolster Springs.
Triple, 3" plates, 40" long between centers.
Bands 3" wide, 11¾" over all across spring.
Each spring to be stamped A on band.
To stand 3½" B. B. at 5,000 lbs. load.
" 3" B. B. at 5,500 lbs. load.
" 2⅝" B. B. aux. plate touching.
Motion to be soft and slow.

Specification B.

36" Double Elliptic Bolster Spring.
Double 3" plates, 36" long between centers.
Bands 3" wide, 7¼" over all across spring.
Each spring to be stamped B on band.
To stand 3¾" B. B. at 5,000 lbs. load.
" 3" B. B. at 6,000 lbs. load.
" 2⅛" B. B. aux. plates touching.
Motion to be soft and slow.

Specification C.

40" Quadruple Elliptic Bolster Spring.
Quadruple, 3" plates, 40" long between centers.
Bands 3" wide, 15½" over all across spring.
Each spring to be stamped C on band.
To stand 3¾" B. B. at 6,650 lbs. load.
" 3" B. B. at 8,000 lbs. load.
" 2⅛" B. B. aux. plates touching.
Motion to be soft and slow.

Specification D.

36" Triple Elliptic Bolster Spring.
Triple, 3" plates, 36" long between centers.
Bands 3" wide, 11½" over all across spring.
Each spring to be stamped D on band.
To stand 4⅜" B. B. at 6,000 lbs. load.
" 3" B. B. at 8,000 lbs. load.
Motion to be soft and slow.

Specification E.

40" Single Semi-Elliptic Bolster Spring.
Single, 3" plates, 40" long between centers.
End eye to receive a 1" bolt freely.
Bands 3" wide, 3⅜" over all across spring.
Each spring to be stamped E on band.
*To stand 4¼" high when free.
" 3" high at 2,350 lbs. load.
Motion to be soft and slow.

* These measurements to be taken under the band, when the spring stands inverted on a surface plate.

Specification H.

Equalizer Spring.
Spiral, 8" dia. × 8¾" high.
Each spring to be stamped H near one end.
To stand 7¼" to 7½" high at 6,000 lbs. load.
" " 6" (or less) when down solid.
Motion to be soft and slow.

Specification I.

Equalizer Spring.
Spiral, 8" dia. × 8¾" high.
Each spring to be stamped I near one end.
To stand 7½" to 7½" high at 4,000 lbs. load.
" " 6" (or less) when down solid.
Motion to be soft and slow.

Specification J.

Equalizer Spring.
Spiral, 5¾" dia. × 8¾" high.
Each spring to be stamped J near one end.
To stand 7¼" to 7½" high at 3,200 lbs. load.
" " 4½" (or less) when down solid.
Motion to be soft and slow.

Specification K.

Equalizer Spring.
Spiral, 6" dia. × 6" high.
Each spring to be stamped K near one end.
To stand 5½" to 5⅝" high at 1,150 lbs. load.
" " 4½" (or less) when down solid.
Motion to be soft and slow.

Specification L.

Equalizer Spring.
Spiral, 5″ dia. × 8¾″ high.
Each spring to be stamped L near one end.
To stand 7½″ to 7½″ high at 1,900 lbs. load.
" " 6″ (or less) when down solid.
Motion to be soft and slow.

Specification N.

Janney Coupler Light Draft Spring.
Spiral, 5″ dia. × 5″ high.
Limits of dia. of hole to be 1⅞″ and 2¼″.
Each spring to be stamped N near one end.
To stand 3⅞″ to 4⅛″ high at 6,000 lbs. load.
" " 3⅝″ (or less) when down solid.
Motion to be soft and slow.

Specification O.

Janney Coupler Heavy Draft Spring.
Spiral, 5½″ dia. × 5¾″ high.
Limits of dia. of hole to be 1⅞″ and 2⅛″
Each spring to be stamped O near one end.
To stand 4⅜″ to 4½″ high, at 8,000 lbs. load.
" " 4¼″ (or less) when down solid.
Motion to be soft and slow.

Specification P.

Janney Coupler Center Buffer Spring.
Spiral, 4″ dia. × 8″ high.
Limits of dia. of hole to be 1 5/16″ and 1 7/16″.
Each spring to be stamped P near one end.
To stand 5¼″ to 6¼″ high, at 4,000 lbs. load.
" " 5″ (or less) when down solid.
Motion to be soft and slow.

Specification Q.

Janney Coupler Side Buffer Spring.
Spiral, 3¼″ dia. × 15¼″ high.
Dia. of hole to be not less than 1 5/16″.
Each spring to be stamped Q near one end.
To stand 12¼″ to 12⅜″ high, at 2,000 lbs. load.
" 10¼″ (or less) when down solid.
Motion to be soft and slow.

Specification R.

Janney Coupler Catch Spring [new style.]
Spiral, 1″ dia. × 8″ high.
Dia. of hole to be not less than ⅜″.
To stand 5⅞″ to 6⅛″ high, at 160 lbs. load.
" 4⅞″ (or less) when down solid.
Motion to be soft and slow.

Specification S.

Bolster and Spring.
Spiral, 2″ dia. × 8½″ high.
To stand 5⅞″ to 6⅛″ high, at 1,000 lbs. load.
" 5½″ (or less) when down solid.
Motion to be soft and slow.

Specification T.

Brake Bar Relief Spring.
Spiral, 1½″ (or less) dia. × 8″ high.
Dia. of hole to be ⅞″.
To stand 5⅛″ to 5⅜″ high, at 400 lbs. load.
" 4⅛″ (or less) when down solid.
Motion to be soft and slow.

Specification U.

Bolster Spring for Dead Hog Car.
Spiral, in nests, 6½″ high over all.
Nests not more than 12″ wide over all.
Not more than 4 springs to a nest, less preferred.
Each nest to be stamped U, near one end.
To have ½″ to ⅝″ motion left, at 13,500 lbs. load.
Motion to be soft and slow.

Specification V.

Bolster Spring for Freight Car.
Spiral, in nests, 6½″ high over all.
Nests not more than 12″ wide over all.
Not more than 4 springs to a nest, less preferred.
Each nest to be stamped V, near one end.
To have ½″ to ⅝″ motion left, at 12,000 lbs. load.
Motion to be soft and slow.

Specification W.

Air Brake Release Spring.
Spiral, 3″ dia. × 15″ high.
Two coils, outside coil 7/16″ wire, inside coil 5/16″ wire.
Dia. of hole to be 1 5/16″.
Each spring to be stamped W, near one end.
To stand 11⅛″ to 11⅜″ high, at 1,200 lbs. load.
To stand 9″ (or less) when down solid.
Motion to be soft and slow.

Specification X.

Long Freight Draft Spring.
Spiral, 6″ dia. × 8″ high.
Dia. of hole to be 2⅛″.
Each spring to be stamped X, near one end.
To stand 6″ to 6¼″ when down solid.
To be down solid at from 12,000 lbs. to 14,000 lbs.
Motion to be slow and soft.

Specification Y.

Short Freight Draft Spring.
Spiral, 6″ dia. × 6″ high.
Dia. of hole to be 2⅛″.
Each spring to be stamped Y, near one end.
To stand 4″ to 4¼″ high when down solid.
To be down solid at from 12,000 lbs. to 14,000 lbs.
Motion to be soft and slow,

Specification Z.

Janney Coupler Horn Spring [Old Style].
Spiral, 1″ dia. × 5⅝″ high.
Dia. of hole to be not less than ⅜″.
To stand 3½″ to 3½″ high, at 120 lbs. load.
" 3″ (or less) when down solid.
Motion to be soft and slow.

NOTE.

1st. All springs must be made of the very best crucible steel.

2nd. All bolster and equalizer springs will be tested. Of other kinds, one in ten.

3d. Springs which are received broken, or which break under test, must be replaced by the manufacturers of same.

4th. Springs will be ordered and must be billed as so many "springs" (even in the case of freight bolster springs), and not as so many "sets" or "bundles."

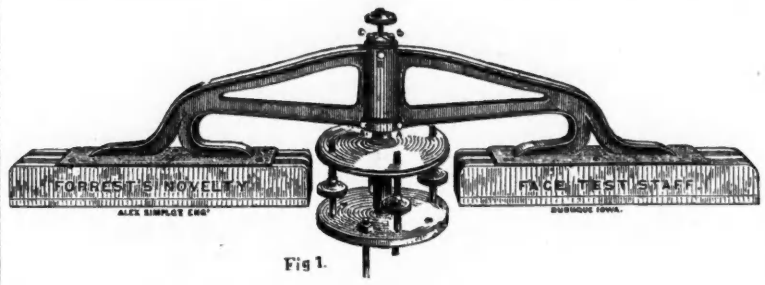


Fig 1.

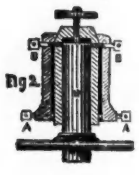
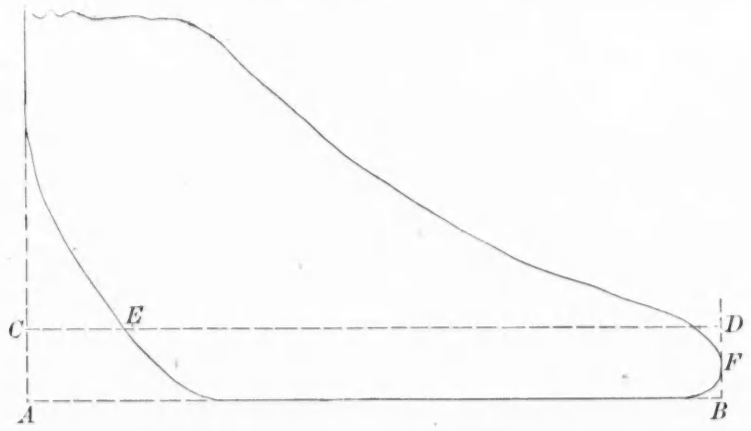


Fig 2.

Computation Table.

T. P	0	1	2	3	4	5	6	7	8	9
3	117.300	121.015	124.717	128.406	132.082	135.748	139.399	143.075	146.665	150.279
4	153.880	157.514	161.137	164.750	168.353	171 945	175.527	179.098	182.659	186.210
5	189.750	193.336	196.914	200.483	204.044	207.598	211.142	214.679	218.208	221.728
6	225.240	228.799	232 351	235.897	239.437	242.970	246.497	250.017	253.531	247.039
7	260.540	264.056	267.566	271.071	274.570	278.063	281.550	285.031	288.506	291.976
8	295.440	298.922	302.400	305.872	309.338	312.800	316.256	319.708	323.154	326.594
9	330.030	333.488	336.941	340.389	343.833	347 273	350.707	354.137	357.563	360.984
10	364.400	367.842	371.280	374.714	378.144	381.570	384.992	388.410	391.824	395.254
11	398.640	402.064	405.485	408.902	412.315	415.725	417.131	422.534	425.933	429.328
12	432.720	436.120	439.517	442.911	446.301	449.688	453.071	456.451	459.828	463.200
13	466.570	469.950	473.326	476.699	480.068	483.435	486.798	490.159	493.516	496.869
14	500.220	503.596	506.968	510.338	513.706	517.070	520.432	523.790	527.146	530.500
15	533.850	537.213	540.573	543.930	547.285	550.638	553.987	557.334	560.679	564.011
16	567.360	570.713	574.063	577.411	580.757	584.100	587.441	590.780	594.115	597.449
17	600.780	604.109	607.435	610.759	614.081	617.400	620.717	624.031	627.343	630.653
18	633.960	637.265	640.567	643.867	647.165	650.460	653.753	657.043	660.331	663.617
19	666.900	670.200	673.498	676.793	680.086	683.378	686.666	689.953	693.238	696.520
20	699.800	703.098	706.394	709.688	712.980	716.270	719.558	722.844	726.128	729.410
21	732.690	735.968	739.244	742.518	745.790	749.060	752.328	755.594	758.858	762.120
22	765.380	768.660	771.938	775.215	778.490	781 763	785.034	788.308	791.570	794.836
23	798.100	801.362	804.622	807 881	811.138	814.393	817.646	820.897	824.146	827.334
24	830.640	833.908	837.175	840.440	843.703	846.965	850.225	853.484	856.741	859.996
25	863.250	866.502	869.753	873.002	876.249	879.495	882.739	885.982	889.223	892.462
26	895.700	898.936	902.171	905.404	908 635	911.865	915.093	918.320	921.545	924.768
27	927.990	931.210	934.429	937.646	940 831	944.075	947.287	950.498	953.707	956.914
28	960.120	963.352	966.583	969.813	973.041	976.268	979.493	982.717	985.939	989.160
29	992.380	995.598	998.815	1002.031	1005.245	1008.458	1011.669	1014.879	1018.087	1021.294
30	1024 500	1027.704	1030.907	1034.109	1037.309	1040.508	1043.705	1046.901	1050.095	1053.288
31	1056.480	1059.670	1062.859	1066.047	1069.233	1072.418	1075.601	1078.783	1081.963	1085.142
32	1088.320	1091.528	1094.736	1097.942	1101.146	1104.350	1107.552	1110.754	1113.954	1117.152
33	1120.350	1123.546	1126.742	1129.936	1133.128	1136.420	1139.510	1142.700	1145.888	1149.074
34	1152.260	1155.444	1158.628	1161.810	1164.990	1168.170	1171.348	1174.526	1177.702	1180.876
35	1184.050	1187.222	1190.394	1193.564	1196.732	1199.900	1203.066	1206.232	1209.396	1212.558
36	1215.720	1218.917	1222.112	1225.307	1228.500	1231.693	1234.884	1238.075	1241.264	1244.453
37	1247.640	1250.827	1254.012	1257.197	1260.380	1263.563	1266.744	1269.925	1273.104	1276.283
38	1279.460	1282.637	1285.812	1288.987	1292.160	1295.333	1298.504	1301.675	1304.844	1308.013
39	1311.180	1314.347	1317.512	1320.677	1323.840	1327.003	1330.164	1333.325	1336.484	1339.643
40	1342.800	1345.957	1349.112	1352.267	1355.420	1358.573	1361.724	1364.875	1368.024	1371.173
41	1374.320	1377.467	1380.612	1383.757	1386.900	1390.043	1393.184	1396.325	1399.464	1402.603
42	1405.740	1408.877	1412.012	1415.147	1418.280	1421.413	1424.544	1427.675	1430.804	1433.933
43	1437.060	1440.230	1443.398	1446.566	1449.734	1452.900	1456.066	1459.230	1462.394	1465.558
44	1468.720	1471.882	1475.042	1478.202	1481.262	1484.520	1487.678	1490.834	1493.990	1497.146
45	1500.300	1503.454	1506.606	1509.758	1512.910	1516.060	1519.210	1522.359	1525.506	1528.654
46	1531.800	1534.946	1538.090	1541.234	1544.378	1547.520	1550.662	1553.802	1556.942	1560.082
47	1563.220	1566.358	1569.494	1572.630	1575.766	1578.900	1582.034	1585.166	1588.298	1591.430
48	1594.560	1597.690	1600.818	1603.946	1607.074	1610.200	1613.326	1616.450	1619.574	1622.698
49	1625.820	1628.942	1632.062	1635.182	1638.302	1641.420	1644.538	1647.654	1650.770	1653.886
50	1657.000	1660 114	1663.226	1666.338	1669.450	1672.560	1675.670	1678.778	1681.886	1684.994
51	1688.100	1691.206	1694.310	1697.414	1700.518	1703.620	1706.722	1709.822	1712.922	1716.022
52	1719.120	1722.218	1725.314	1728.410	1731.506	1734.600	1737.604	1740.786	1743.878	1746.970
53	1750.060	1753.150	1756.238	1759.327	1762.414	1765.500	1768.586	1771.670	1774.754	1777.838
54	1780.920	1784.002	1787.082	1790.162	1793.242	1796.320	1799.398	1802.474	1805.550	1808.626
55	1811.700	1814.829	1817.957	1821.084	1824.211	1827.338	1830.463	1833.588	1836 713	1839.837
56	1842.960	1846.083	1849.205	1852.326	1855.447	1858.568	1861.687	1864.806	1867.925	1871.043
57	1874.160	1877.277	1880.393	1883.508	1886.623	1889.738	1892.851	1895.964	1899.077	1902.189
58	1905.300	1908.411	1911.521	1914.630	1917.739	1920.848	1923.955	1927.062	1930.169	1933.275
59	1936.380	1939.485	1942.589	1945.692	1948.795	1951.898	1954.999	1958.100	1961.201	1964.301
60	1967.400	1970.499	1973.597	1976.694	1979.791	1982.888	1985.983	1989.078	1992.173	1995.267



A New Computation Table.

By E. W. Thompson.

The most common way of computing a steam engine's rate of water consumption has been by the aid of the table published in the circular of the Buckeye Engine Co., which is a shorter method than by any table of volumes. The table herewith submitted is not given as an entirely new idea, but simply as an elaboration of the Buckeye table. In that table one has to find a number corresponding to the given terminal pressure, interpolating if it is not a whole number of pounds. Then multiply the number thus found by the terminal pressure, divide by the mean effective pressure, and make allowance for clearance and compression. The object of the accompanying table is to dispense with the interpolation and with the multiplying of two tabular numbers.

To use the table: Make the construction on engine diagram as in the figure, namely, draw vertical lines at each end and continue the expansion curve to *D*, in order to see what the expansion would have been if the exhaust port had not begun to open until end of stroke. *D* is the point from which to measure the terminal pressure. From *D* draw *D C* parallel to atmospheric line, find its length and also that of *D E*, ascertain the terminal pressure (from vacuum), and mean effective pressure.

Look in the table for the integral part of the given terminal pressure in the first vertical column (marked *T P*), and for the decimal part, to the nearest tenth, in the first horizontal column. At the intersection of the corresponding column, the same as in a table of logarithms, will be found a number which, divided by the mean effective pressure, will give the water rate uncorrected for clearance and compression. This correction is made in the usual way.

For example, suppose the data on an engine diagram to be as follows:

T. P. ..... 28.3 pounds.
M. E. P. ..... 44.6 "
Length of diagram *D. C.* ..... 3.7″
Length of line *D. E.* ..... 3.2″

In the first vertical column find 28, and in the first horizontal column find 3; the corresponding tabular number is seen to be 969.813, then the amount of water required to develop in that engine one indicated horse power for one hour is $\frac{969.813}{44.6} \times \frac{3.2}{3.7} = 18.8$ lbs.

Test Staff for Testing and Dressing the Faces of Burrs.

Reducing the faces of millstones to perfectly true planes is a matter of such importance that, though thousands of dollars may be expended in perfecting all other parts of a mill, and there appears a fault to the extent of an hundredth part of an inch in the faces of the stones, the mill will prove, to this degree, a failure in the manufacture of flour under the latest granulating processes. The inventor of the instrument, here illustrated, for testing and correcting the faces of millstones, observing that many devices have been invented for such purpose, and that the best of them have only afforded the miller the means of doing some very good or very poor guessing, according to his natural ability in such direction, set himself about constructing an instrument that should reduce such test to a certainty. The result was the instrument here illustrated—one combining, it is claimed, all the principles of adjustment necessary. As that form of test called a "swing staff" has approached the nearest to perfection, with reasonable cost, lacking only in several important elements of adjustment, it has been adopted as the main feature of this instrument.

As before stated, the flouring surfaces of millstones will do perfect work only as they conform, throughout their whole extent, to exact geometrical planes; and any instrument that shall define or determine such planes, in the form of a revolving staff, must not only be capable of adjustment to such planes, but must remain constant throughout indefinite revolutions of the testing surface. When an instrument is so made that its testing surface is adjustable to the required geometrical plane, its utility for the purpose under consideration depends upon another adjustment, viz., to the average face of the burr which is to be dressed into truth with it. These two independent adjustments, together with the mechanical means employed to make them, constitute the novel features of this staff; in fact, they are what makes it a reliable test and guide for the operator.

The general principles of this instrument will be readily comprehended by an inspection of the cut, but its use will require some explanation. The hub of this staff is in the form of a hollow cylinder, within which is a supplemental cylinder, which forms the socket for the spindle of the leveling head (which is identical in construction with the leveling heads used with the field instruments of engineers), as shown in cut, Fig. 2. This inner cylinder is fitted to the taper bore of the hub at the upper end, with clearance below point of bearing to admit of the movement of the lower end of the cylinder in any direction. The inner cylinder is milled or sawed through quadrangularly at upper end, so that when forced into the taper bore of the hub, it is brought in close contact with the spindle, thus always securing an exact fit of the working parts. The inner cylinder is adjustable by means of the capstan-headed screws *a, a, a, a*. This cylinder is also sawed through one side at lower end, so that the operation of adjusting by the screws *a, a, a, a*, presses it in close contact with the spindle, by slightly compressing its diameter and yet allowing it to turn easily upon the spindle. The two screws *c, c*, at top of hub, are used to draw the tapering end of the inner cylin-

der into the tapering bore of the hub with sufficient firmness, and the two screws *b, b*, on opposite sides, clamp the cylinder fast in its position when properly adjusted. The two former of these screws *c, c*, should not be tightened so firmly as to press the cylinder against the spindle to such a degree as to render the movement difficult. All the screws should be firmly set when the adjustments are completed, and after moving any of the screws test the face adjustment again, before using the staff on the burrs.

It will readily be seen that after dressing the face of the revolving staff into truth with the "proof staff," in the usual manner, if the socket of the spindle was fixed instead of adjustable, the face of the test staff would require to be again dressed by trial into proper relation of face and axis, which would be next to an impossibility. In this instrument the face is dressed to the proof without reference to any other condition, and is afterwards adjusted into proper relation to its axis of motion. This adjustment is effected by placing it upon the spindle, and by means of the screws *a, a, a, a*, adjusting until the face, from end to end, swings in an exact plane.

Determine this last fact by holding a pencil, point upwards, to face of staff. When the pencil will make a fine mark clear across the face, at the extreme ends, when brought alternately over it, the adjustment so far is complete. Next, place the leveling head upon the stone or burr to be tested by means of hook bolts, to clutch under tail of runner or bush of bedstone, and adjust the staff to the average face of the stone as follows: Set the spindle as nearly perpendicular as can be guessed at with staff upon it; then loosen one pair of the leveling screws so as to allow the spindle, with upper plate, to tilt towards either one of the screws; bring the bar of the instrument over this pair of screws, and, by means of the lighter screw at top, let the staff down until the face rests fairly on the face of the stone; tighten this pair of screws carefully, and repeat the operation with the remaining pair. Next, bring the bar back over the first pair of screws and place a piece of uniform cardboard or paper under each end of the staff and let it down upon the pieces. If one card draws easily and the other hangs because of the pressure, tighten the leveling screw next to that end a little firmer, being careful, when both screws are firmly set, so as to prevent all movement of the upper plate, that both cards indicate equal pressure of the staff. Repeat this operation with the remaining pair of screws, and the staff will be in adjustment to swing in a plane that will coincide with the average face of the stone. Then, by painting the staff on the face and letting it down gently upon the stone as the staff is revolved, the high portions of the stone will be painted, and so continue until the stone is dressed into a true face.

This staff, like all other instruments for testing the truth of mechanical operations, will be perfectly worthless unless the greatest care and skill are employed in its construction. The usual off-hand manner of making general machinery will not answer the purpose. This instrument is not patented, and is the invention of Mr. A. Forrest (now with the Novelty Iron Works, Dubuque, Iowa), who informs us that he proposes to offer no objections to any party making or selling the tool.

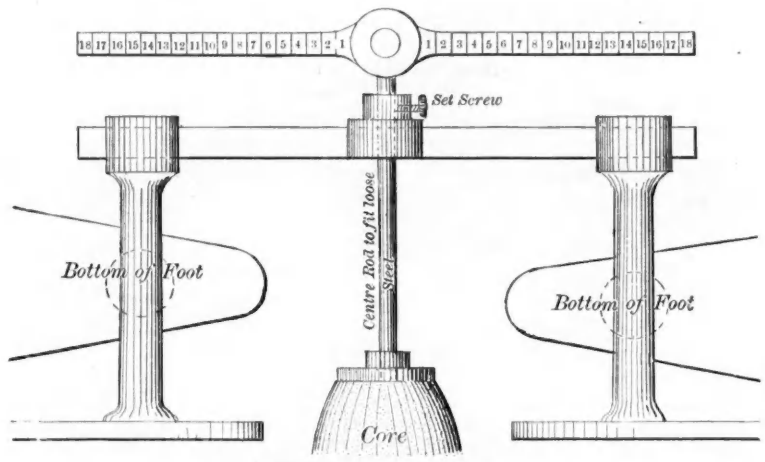
LETTERS FROM PRACTICAL MEN.

A New Foundry Device.

Editor American Machinist:

I have in my experience had considerable trouble and a feeling of uncertainty attending the setting of cores in pulleys and gears, and, in fact, all castings that were round, but particularly in those where the joint of mould was one-half of hub. The longer the hub the more uncertainty. Having had considerable difficulty recently, I devised the instrument or tool shown in the sketch. It is, I suppose, a species of the trammel family. Instead of two points it has but one, and that a dead center. The legs are movable. Since using this tool I have not seen a core out of center. It does its work nicely and so quietly, that I am persuaded by Mr. Tabor to let you know of it, and the rest of the foundry fraternity. You will see the bar is graduated on each side of the center, and the numbers indicate the space between the bottoms or feet. The height of the posts, or length of cross bar or scale, can be made to suit the work to be centered. When large enough for the largest—and it will be small enough for the smallest—it centers four ways at once. The moulder does not have to travel around his flasks three or four times to center his core; he does it without all that pedestrianism.

Now this tool will not do work that requires a thousandth part of an inch, but it will get that core so near the center that the cope print will be sure to bring it to place.



A NEW FOUNDRY DEVICE.

In this sketch you will see a button on center pin; that I have on mine is ¾″ diameter, as the smallest core is ½″. When that comes down on top of core it is an easy matter to center a 2″ or 3″ or 4″ from the space outside of button. The feet you see are somewhat of the form of a sand joint between arms of pulley. Find the distance with a rule, say it is 8″. Move each post to 8, and set your feet on joint between arms. Let down center, and that tells the story. If the mould is not level, it will perform just as accurately.

Now if this is an old thing, or has been long in use elsewhere, I will say the fellow that has seen or used one is too selfish to live in this nineteenth century.

FOUNDRYMAN,
(from Toledo).

Electricity in Steam Boilers.

Editor Am. Machinist:

Experiments made a few years ago by some of our scientific men on the generation of electricity in steam boilers, clearly demonstrated that the steam boiler not only generates steam, but also electricity, the quantity of which is governed by the purity of the feed water.

The discovery was made accidentally. The safety valve of a steam boiler was blowing off, and the fireman attempting to press the lever down with one hand while the other was in the escaping steam, felt, as his hand approached the lever a strong shock, and saw a spark.

Mr. Armstrong having been informed of the fact made some experiments on different kinds of boilers, and found that escaping steam was charged with positive, and the boiler with negative electricity, and that the generation of the spark was due to the friction of the globules of steam striking against any obstructions. He also further found, with the assistance of Faraday, that steam of water containing some fatty matters, or acid, showed no trace of electricity.

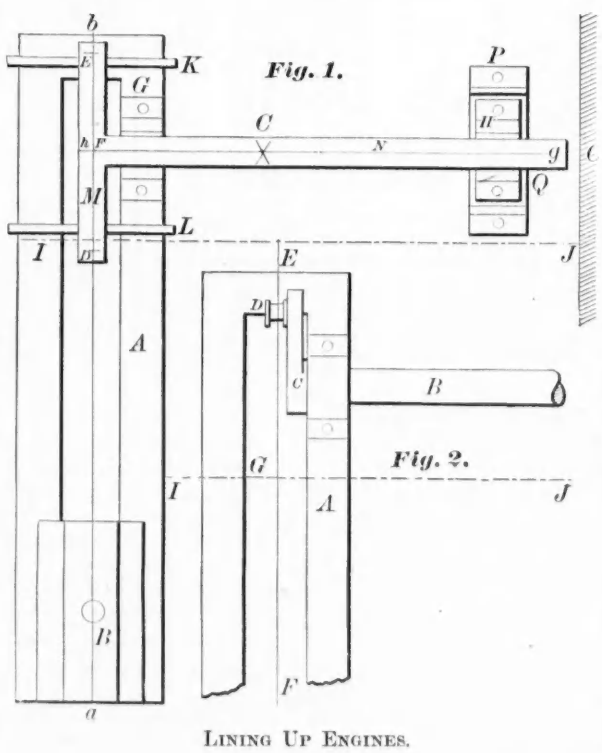
Now, according to the experiments of a Belgian engineer on the same subject, it was found that steam of water as commonly used in boilers will generate an electrical spark, when discharged against a red hot, or even dark warm iron rod.

The theory of the friction of the globules of steam apply well to the bursting of steam pipes, whose cold surface the steam strikes on entering the pipes, which (if) charged with electricity will generate the spark to ignite the explosive gases the pipes may contain, or that has preceded the steam from the boiler.

It also seems very strange when a boiler which is in good condition, having no more than 50 lbs. steam pressure; the water height all right and everything in good working order; the damper closed for the dinner hour—upon starting up the engine should all at once explode, go through where the biggest gun could not send a projectile, and shake all the windows for a mile round. There must be some unmeasured agent to ignite this gas, as the steam pressure could never cause such disaster. Some explosive gas is the agent, but the electrical spark is the generator.

L. J. H.

Chases' Mills, Me.



LINING UP ENGINES.

Cleaning Locomotive Brasses—Information Wanted.

Editor American Machinist:

Noticing in your issue of August 6th a query of "J. H. R., Houston, Tex.," in regard to some preparation for cleaning brass on locomotives. and having had some experience in that line, I thought I would write to you and give a recipe for making a "dose" that is used extensively by the firemen on the C. B. & O. R. R. It is as follows:

Sperm, 1½ pounds (three coach candles is what I use); gum camphor, 2 ounces; carbonate of ammonia, 3 ounces; kerosene oil, 1 quart; muriatic acid, 12 drops; tripoli, 3 pounds.

Melt the sperm, and then add the balance in the order named, taking care to get the camphor dissolved thoroughly before adding the ammonia, and being careful to get the tripoli fully mixed and have no lumps.

This will make one gallon, and will cost, exclusive of the sperm and kerosene, 45 cents, and will last from one to three months. It gives the best results when used with weak oxalic acid. Dissolve a teaspoonful of oxalic acid in a quart of water, and add three tablespoonfuls of tripoli. Wash the brass with this, and scour it off with the dose, and the result will be a surprise to one who has never used the mixture. If polished with dry lampblack, the appearance of the brass will be materially enhanced.

While I am not a "practical man," I do claim to be an "aspiring boy;" and therefore I call upon the engineers, both stationary and steamboat, railroad and marine, to take advantage of the opportunity you so generously afford them in the use of your columns, for the free interchange of ideas and experience.

While the machinists, moulders, draughtsmen, etc., have all come to the front, the engineers are rendered conspicuous by their absence—excepting always "49er," whom "Easy Way" exasperated beyond the bounds of silence, and who came forth in a very readable and interesting article on the river boats.

Now, why cannot some of our old locomotive runners come out and give a youngster some idea of how to set an eccentric, block up a driving spring, fasten a cross head or valve stem, in case of having to disconnect one side, and the thousand and one other points in a locomotive which will bear discussion? I am sure an exchange of views on these and other subjects will do no harm, and possibly might benefit somebody.

I hope to hear from some of our experienced engineers.

THEO. W. MCCULLOUGH.

Ottumwa, Iowa.

Shop Kinks.

No. 16.

BY L. F. LYNE.

SETTING ENGINES AND SQUARING SHAFTING.

When the engine, alluded to in my last article on shafting, which was over a hundred horse power, and having a box bed plate, was placed upon the foundation, its weight was barely sufficient to bring it down upon the foundation. The reason of this was the anchor bolts, which were six in number and 1¼″ in diameter, while the holes through the bed plate were but 1⅝″ in diameter by 8″ deep. After leveling up the engine and measuring from the line *g h*, the variation of the two ends of the bed plate with the line was less than the thirty-second part of an inch. Had it been required to move the engine bed, after being placed upon the foundation, it could only have been done by chipping out the holes which would have been an endless task.

I claim that it always pays to take accurate and reliable measurements at the commencement, which will save a great deal of fault-finding and an extravagant waste of time in making the best of a bad job. I always like to level an engine bed upon shims, and never upon wedges, as they are too apt to move. By driving wedges under the bed plate it may be raised, and strips of iron so placed under it as to hold it in position, while cement may be run between the bed plate and the foundation, as described by V. Hook, in his article before mentioned.

For setting engines I prefer Portland cement, as it is easily obtained and handled, making a satisfactory job every time.

After the engine bed has been properly placed upon its foundation, the next step is to square the two pillow blocks for the reception of the shaft. In the case of large engines, or where the foundations for the engine bed and outboard pillow blocks are to

be built solid, it is necessary to make a templet for the sole plate, and the anchor bolts set as described for setting the engine bed. A center line for the shaft must be put upon the templet for the bed plate, also upon the templet for the sole plate.

To set the latter square with the former, stretch a fine line across and square it by the problem shown in Fig. 2 of my former article. Where the outboard pillow block has a sole plate, this preliminary operation need not be extremely particular for the reason that the pillow block may be finally adjusted upon the sole plate. But where the pillow block has no method of adjustment, the first work of setting the templet should be done very carefully. To set the pillow block at the right height, put a wooden center in the hole for the shaft, and find the center, which should be marked upon a piece of tin fastened to the block.

This is done to enable close measurements to be taken. The tin center may be made of a small, triangular-shaped piece of tin with the corners turned down and driven into the wood. A like center should also be put into the main pillow block, after which measurements should be taken from a straight edge placed across the bottom to the centers of each. This will enable the workman to get the difference in height between the foundation for the bed plate and outboard pillow block. When these two are in position, and the masonry is sufficiently hardened, they should be leveled and squared exactly for the reception of the shaft.

To square the pillow blocks properly will be explained by a reference to Fig. 1 of the accompanying engravings, where *A* represents the bed plate, *G* the main pillow block, and *H* the outboard pillow block.

Stretch a fine line, *a b*, through the cylinder *B*, and draw it up as taut as the line will reasonably stand; then set it carefully by the bore of the cylinder. Calipers are much used for this purpose, but I prefer a round pine stick with a pin stuck in the end, and set so that the head of the pin will just touch the line, with the end of the stick resting against the bore of the cylinder. If both heads of the cylinder are removed, so much the better; but if not, set the line in the same manner by the stuffing box, using a shorter stick.

The stuffing box and cylinder should be tested by the line, as bad workmanship upon the lathe frequently throws the hole for the stuffing box out of the center. In such a case the line is to be set centrally with the bore of the cylinder.

After the line has been set, a wooden straight edge, *N*, should be placed across the pillow blocks. This straight edge should be slightly narrower than the diameter of the shaft, and firmly held against the face of the journals next the cylinder, by means of small wedges.

After placing the straight edge *N*, a piece of board 6″ to 8″ wide by 6 feet long and planed upon its upper surface, should be placed across the end of the straight edge, as shown at *M*. The best way is to fasten the two together by means of a strip nailed to the under side, which brings the upper faces flush with each other, This piece is to be supported by two strips *K* and *L*, so as to just clear the line drawn through the cylinder. A fine line, *g h*, should now be stretched between two tacks upon the straight edge, exactly parallel with the edge of the same.

With a pair of fine-pointed trammels, from *F* as a center, set off the distances *D* and *E*, and make a fine scriber mark upon tin centers where these lines intersect with the line *a b*.

Now from any point *C*, upon the line *g h*, set the trammels to the distance *C D*; then if the distance is equal to *C E*, the line, *g h*, is at right angles to *a b*. But if not, then the outboard pillow block must be moved until the distances *C D* and *C E* are equal. With a square upon the sole plate, and touching the edge of the straight edge, make a permanent mark upon the sole plate at *Q* to square the shaft by, when occasion may require, without the necessity of again running a line through the cylinder. Permanent marks may be put upon both pillow blocks for future reference.

Sometimes upon an engine having a box bed it is a wise course to put a fine scriber mark across the top of the bed, and extend the same, *I J*, to the wall *O*, by means of a straight edge. There are many different ways of squaring a steam engine shaft, some of which I will describe. Many mechanics put the shaft *B* in position as in Fig. 2, tighten up the cap and quarter boxes upon the pillow block, block up the end of the shaft, and set the outboard pillow block by the shaft.

A line, *E F*, is then stretched through the center of the cylinder, and the crank *C* turned so as to almost touch the line at *D*. The distance between the line and the collar upon the crank pin is then accurately marked upon a stick cut so as to fit exactly between the collars upon the pin.

The crank is then turned to a corresponding position at *G*, and a like measurement taken. If the line upon the stick corresponds with the line, *E F*, in both cases, the shaft *B* is supposed to be at right angles to the line *E F*.

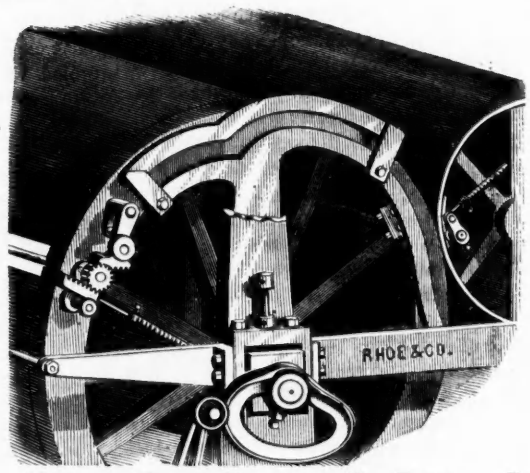
The shaft is to be horizontally set by a spirit level in all cases. This is also a very good way. A very common but unreliable method is to place the shaft as shown in Fig. 2, and, without removing the piston, key up the connecting rod on the cross head, leaving the other end free. Place the crank upon the centers, and measure with a scale from the end of rod to the collar on crank pin. If these measurements correspond, the shaft is supposed to be at right angles to the center line of cylinder. This is a most unreliable procedure, for the reason that its accuracy is chiefly dependent upon the manner in which the parts have been fitted up. Any inaccuracy in the cross-head pin, rod brasses or pillow block will lead the workman astray.

I remember where engine shafts have been lined up in this way, when, after the belts were put on and the engine started, it was found that the shafts were from $\frac{3}{16}$ inch to $\frac{1}{4}$ inch out of square.

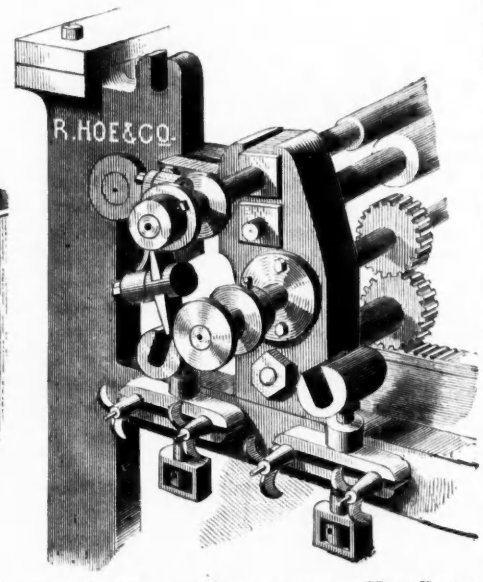
It is always cheapest to work in a manner so that at any point during the progress of the work the workman will know just how matters stand, and justly feel that he is willing to have his work inspected.

When the engine has been set, squared and the outboard pillow block securely keyed to its position upon the role plate, we may turn our attention to the shafting in the shop, referring to Fig. 1, in the American Machinist of Sept. 17, 1881.

Having laid out the line *a b* for the main line shaft, we wish to put up other lines parallel with the same. It may be possible, and frequently is the case, that the shafting required last is ready for use first. In such a case, many workmen are puzzled to know what to do until they get a portion or all of the main line so as to work from it.



Noiseless Finger Motion on Hoe Press.



Positive Vibratory Apparatus on Hoe Press.

Some New Devices in Printing Presses.

Upon the large cylinders of most printing presses are little arms, attached to a shaft extending the length of a channel cut across the face of the cylinder. These little arms are called fingers, from the fact that they are in the shape of fingers, open and in closing as the cylinder revolves, catch the edge of the sheet of paper to be printed, instantly grasping the edge of the sheet and drawing it around with the cylinder. We illustrated a new noiseless finger motion applied to the Hoe press. After passing over the form and the impression being taken, the fingers open; releasing the printed sheet, which is delivered upon the fly, and from thence to the table. This movement consists of an arm pivoted to the side of the cylinder at one end, with a toothed arc at the other.

This arm receives its motion through a roll at its side, which passes through the cam-shaped groove shown at the top, and attached to the frame of the press.

A portion of the frame is removed to show the construction. Motion is communicated to the finger shaft directly by means of a pinion between the arc and rack. A spring operating the rack closes the fingers upon the edge of the cylinder after accomplishing their work.

The positive vibratory apparatus also illustrated, is used for spreading a uniform thickness of ink over the entire length of the rolls. This is accomplished by giving a longitudinal movement to one or more of the inking rolls as they revolve.

To accomplish this movement a small gear, connecting with a rack attached to the table of the press, gives motion to another gear upon a shaft. A slotted cam is placed upon the end of this shaft, and gives motion to a lever with a roller upon one end. A roller upon the other end moves between two collars upon the end of one of the inking rolls, so that when the cam revolves a longitudinal movement is communicated to the roll which spreads the ink, as described. The improvements here described are put upon some of the latest printing presses manufactured by R. Hoe & Co., 504 Grand St., New York.

Boiler Explosion in Jersey City.

Another terrible boiler explosion recently occurred, which in its character was the most destructive of any that ever occurred in Jersey City, resulting in the killing of two persons and seriously wounding of five others. The circumstances attending this explosion, which occurred September 13, 1881, at 7.30 A. M., are, in substance, as follows:

At the foot of Essex Street there lies a medium-sized dry dock. An engine and boiler are located upon the top at the side of the dock, for operating the pumps for pumping the water from the air-tight compartments of the dock. The boiler was of the locomotive type, having a dome upon the top. The engineer upon the morning of the explosion lighted the fire in the boiler, and shortly afterwards was called away, leaving the boiler in charge of his nephew, who was young and inexperienced in the handling of steam. After putting fresh coal in the furnace he was called away by one of the owners of the dock to assist at some outside duty. Upon his return he saw the seams of the boiler opening, and attempted to open the furnace door, but was unable owing to the excess of pressure of steam within the boiler which had caused the head to change its shape. A few moments afterwards the explosion occurred. The fire box being thrown downwards, the top of the shell and crown sheet upwards, while the cylinder part shot directly up the street. It struck the ground about 400 feet from its original position, demolished a fire hydrant, several trucks, trees and a horse, and spinning end for end, came to rest by the side of a truck, which it destroyed, about 642 feet from its starting point. Subsequent investigation revealed the fact that the boiler was not properly supplied with water. A portion of the crown sheet which we examined showed conclusively that near the flues it was red hot. We also examined the safety valve, which is of the wing pattern, having a lever and weight. This valve was so firmly corroded fast to its seat that it could not be removed, and the stem was also corroded fast. The whole secret of this explosion is that the boiler was short of water and an excessively high pressure of steam was raised to an unknown point; which, without relief, acquiring sufficient force, tore the boiler to pieces.

We are informed that in Jersey City there is no law requiring a boiler to be inspected, neither are licensed engineers required. The fact is that any person is allowed to place an old shuck of a boiler (bought from some "cheap John" place) in the cellar of any building upon the public streets, where, should an explosion occur, the whole block is in danger of being torn down.

The fact is that steam machinery is handled far too carelessly, and by cheap help who cannot afford to buy proper and necessary mechanical literature to instruct them. The boiler in question was so situated that had it been blown in almost any other direction it must necessarily have been attended with great loss of life.

In France, Germany, and some other European countries, boiler explosions are comparatively little known. There they have a rigid system of Government inspection. When a boiler explosion does occur, a searching investigation is made, and a remedy applied, and the person to blame is treated the same as other criminals.

In this country the legal procedure after boiler explosions more resembles a farce than anything else. It is hoped that this explosion will be another close reminder to urge proper State legislation to protect life and property from boiler explosions.

It has been suggested, as a reason why girls do not, as a rule, acquire greater proficiency in many of the lighter mechanical industries, for which they would seem to be well adapted, that they do not, for obvious and natural reasons, enter upon such pursuits with the intention of making them the business of their life. It is more than probable that the same causes operate, to a great extent, to impair the proficiency of boys engaged in mechanical pursuits. While it is not necessary for a young man, when working at some trade as an apprentice or journeyman, to believe that he is never to better his condition by leaving entirely his present occupation, it is necessary that he should put the same energy into his work that he would if he knew it was to be the business of his life. As a rule, advances are made in the direction of previous education and training; and, in any event, the habit of putting all one's energy into present business, fits the individual to apply the necessary force in new directions

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☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

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☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

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NEW YORK, OCTOBER 1, 1881.

CONTENTS.

PAGE.
New Engine Lathe 1
The Davidson Independent Steam Pump and Condenser 1
The Water Power of Niagara 2
Westinghouse High Speed Steam Engine 2
German Exhibition Notes 3
Recent and Needed Railroad Inventions 3
Feeding and Shrinkage of Melted Iron 4
Car Spring Specifications 4
A New Computation Table 5
Test Staff for Testing and Dressing the Faces of Burrs 5
Letters From Practical Men—A New Foundry Device—Electricity in Steam Boilers—Cleaning Locomotive Brasses; Information Wanted 6
Shop Kinks. No. 15. By L. F. Lyne 6
Some New Devices in Printing Presses 7
Boiler Explosion in Jersey City 7
An Excess of Railroad Building 8
Margins of Profit in Manufacturing 8
Misapplications of Science 8
Steam Engine Nomenclature 8
Questions and Answers 9
Manufactures 9
Newly Incorporated Companies 9
Machinists' and Engineers' Supplies 10
Iron and Metal Review 10

The printed date on each wrapper shows the time to which the subscription is paid. We discontinue the paper in all cases when the time paid for has expired, unless renewed.

An Excess of Railroad Building.

One of the most potent factors in starting up and maintaining the boom in the iron and machinery industries during the last two years has been the rapid extension of railroads, and the equipment of both old and new roads. This has given an impetus to almost every kind of manufacturing industry. While railroad business continues brisk, the boom may be expected to last; but when, whatever be the cause, railroad enterprises experience a set back, the effect will surely be communicated to the iron and machinery industries. Financial disasters in railroad matters precipitated the dull times which ruled from 1873 to 1879. It is to be hoped that the same experience will not be repeated: but with the present feverish haste to build roads where there is no probability of remunerative traffic for years to come, if ever, and the consequent disappointment to investors, there is danger of a reaction, which will not be at all salutary.

Margins of Profit in Manufacturing.

There are few things more deceptive at first glance than the margin of profit which is needful to render the manufacture of a new article remunerative. There is only one thing less deceptive in many establishments, and that is the proper margin on many articles which have long been manufactured (perhaps *made* would be the better word), and which are, or should be, staple.

Novelties in manufacture divide themselves naturally into several usually well-defined classes.

Those whose peculiar merits entitle them to general introduction are often the very specialties in connection with which there is the greatest tendency to blundering. The inventor may or may not have business ideas, and however good his ideas may be, he may or may not have business experience. The history of mechanics is full of promising inventions, which by falling into the wrong hands, have been practically strangled by inflated ideas of their value, which found expression in inflated prices.

Perhaps an equal mortality has arisen from fixing prices too low to justify the effort required for extended introduction. Instances are abundant in the mind of almost every mechanic of inventions which, through bad management, have dwindled along for years, and were only dragged into an obscure sort of notice by the advent of bold and business-like infringers. As many more have been made prominent after the starvation, or asphyxiation, of the original promoters opened the way to business prices and methods on the part of their successors.

Any one who has ever had experience in introducing a novelty has observed, that only about three men out of every twelve approached, if the article is a good thing, will naturally be disposed to recognize its working qualities without cavil. Each of the other nine will find a different objection to its practical workings, if objection is possible, while, whether they buy or not, nearly the whole twelve will probably unite in assuming that the price is too high.

One of the most difficult things to pull against in introducing a new specialty is the opinion of possible buyers that the price asked is exorbitant. Different men have, of course, different ideas regarding the meaning of this word; still, any desired number of average buyers, when once convinced that the price, though apparently high, is still reasonable, all things considered, is more likely to be reached at a reasonably high price than at an unreasonably low one. A good many salesmen regard buyers as lambs to be plucked, an idea which perhaps has taken its rise from the observed fact that the average buyer, lamblike, prefers to go with the crowd. Every sensible buyer knows that extended sales are necessary to low prices. Every sensible buyer knows that it is the profit made from previous sales which has enabled the manufacturer to bring the invention to his notice. Every sensible buyer expects to pay his fair proportion of the expense of popularizing any valuable specialty. When the thing ciphers itself down to considerations of absolute personal profit, however, it is here that the average buyer is apt to be stampeded away from, rather than towards the desired point. Of course, good judgment is, and must be, of necessity, the court of last resort in determining the question of profit at this point.

Specialties whose merit is only fairly comparative and moderate have to be treated somewhat differently. Considerations of price determine the sale here also, but it is the price of the competing article, whether it be something similar in its nature, or a process which is to be superseded, which is to be mainly regarded. Few business men fully realize to how great an extent they are indebted for their sales to the efforts of competitors, in stirring up interest in a product common to all. When the millennium comes business men, competing in the same line, if they do not pay their share towards their neighbor's salary list, will, at least, appreciate the advantage which comes from birds of a feather flocking together.

When a specialty possesses, say, mechanical merit abstractly considered, but is the sort of thing which a mechanic can make for himself more easily than he can buy it, the lines of the salesman are hard. Judgment counts for little, and the best preparation for business is often to get the specialty incorporated into some established business as a catalogued detail.

Specialties that possess no merit whatever and have no *business* in them, are oftentimes the source of greatest trouble to the anxious promoter. The best establishments have often found themselves hopelessly defeated in this way. Defects have been discovered subsequently, the possibility of which was not thought of in the first flush of enthusiasm, or the fact has been demonstrated that the need to be supplied was more fancied than real. A good plan to pursue in cases where doubt is possible, is to follow the plan pursued by a famous poet with his verses, and lay the whole thing away until its projector can examine it in an unbiased and critical light, unswerved by the deceptive glamor of invention.

The correct margin of profit on many articles that should be staple in shops which turn out a variety of product is often misstated in cost books. Too often the idea that labor, material and selling expenses aggregate the total cost of an article of manufacture, tends to defeat the object for which the business is conducted. A good many establishments that ought to be pushing some well-defined branch of business successfully, fritter away time and capacity and opportunities on side issues, and never once think that the profits they do *not* make onght to be added to the profits they *do* make on such products, if their manufacture is to continue as a department worth having.

Misapplications of Science.

The truths of nature revealed by scientific study and experiment are useful only as they are applied by honest individuals. A knowledge of the useful arts in possession of an unscrupulous counterfeiter is a positive damage to society. He may carry on his operations so as to evade any open infraction of the laws, but none the less does he deserve the censure of all upright citizens. Such, however, has been the progress of so-called liberal ideas, that the boldest promoters of counterfeiting are by many regarded as shrewd business operators, who are entitled to high enconiums for their sagacity and enterprise. We have recently in these columns noted the incorporation of one company "to manufacture and sell sugar, grape sugar, glucose and starch," and another "to manufacture and sell a new product, composed of grape and cane sugar." No one at all conversant with commercial affairs will for a moment suppose that the projectors of such an enterprise intended to have the "new product" placed upon the market and sold to consumers for what it really is. The explanation would in most cases destroy its sale, for grape sugar or glucose is not only cheaper, but is deficient in the saccharine properties of cane sugar. The manufacturers will probably sell the article to middlemen without any attempt at misrepresentation, but knowing as they do that deception must be practiced to induce consumers to buy it, who shall say they are guiltless of intentional fraud? It has been the strongest defence of the manufacturers of oleomargarine, or imitation butter, against the charges of deception brought against them, that they invariably sell their product for just what it is and label it plainly This exempts them from the penalties of the law, but full well do they know that frauds must be resorted to in order to sell any large quantity of the imitation butter to actual consumers. Oleomargarine is colored to give it the appearance of real butter. Were it not so, but a very small quantity of it could be sold in retail stores. The number of places where it is sold under its real name is very few, indeed, yet immense quantities of it are manufactured.

Lately, the manufacture of an imitation butter from cotton seeds has been undertaken. The discovery has been widely published, as well as the special information that it has been successfully worked and colored, so as to closely resemble real butter. If no fraud were intended, why need the projectors of this new enterprise be so desirous of exactly imitating genuine butter? When the promotion of frauds is rendered respectable in public estimation, we will need to adopt a new code of ethics.

Steam Engine Nomenclature.

The expressions high and low pressure, as applied to the steam engine, are used so loosely at the present as not only to be confusing to those who are not particularly skilled in steam engineering, but as sometimes to puzzle skilled engineers to know what is meant. For instance, it is customary to speak of a non-condensing engine as a high pressure, and of a condensing engine as a low pressure engine—and this, notwithstanding the latter may use steam of a higher pressure than the former. Again, an engine using steam at 200 or 300 pounds pressure is called a high-pressure, engine without reference to whether it is a condensing engine or not; while the initial cylinder of a compound engine is called the high pressure, and the last cylinder in which the steam is used the low-pressure cylinder, without, as first noted, any reference to whether the steam is condensed or whether the last cylinder exhausts into the atmosphere.

In the earlier days of the steam engine steam was used to displace the air from the cylinder, so that a vacuum would be produced upon the condensation of the steam, and the real impelling force was the pressure of the atmosphere. Of course steam of low tension answered all requirements. Later it was conceived that the piston could be moved by the pressure of steam alone; but since the assistance of the pressure of the atmosphere was dispensed with, it would be necessary to use steam of about one atmosphere, or fifteen pounds greater tension; hence the expressions high and low-pressure engines—expressions that correctly stated the conditions. Still later, engineers began the use of high pressures in condensing engines, and at the present time the terms have lost their signification. Hence, when we hear an engine spoken of as high pressure, we are never certain whether it is a condensing or non-condensing engine, neither does it express anything definite as to what pressure is used.

It would greatly simplify matters if the expressions high and low pressure were discarded, and engines spoken of as condensing and non-condensing qualified, in the instance of exceptional steam pressure, by a statement of the pressure *by gauge*.

On pages 4 and 5 we publish the table of standard specifications of car springs for the Pennsylvania Railroad. This table, simple as it appears, is based upon the most extensive practice and scientific experiments, and is well worth preservation by railroad men.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(1) J. R., Detroit, Mich., asks: 1. What is meant by the weight of steam? *A.* The weight of the water that would be obtained by condensing the steam. 2. What is the weight of steam? *A.* The weight of the same quantity is different at different pressures; thus a cubic foot of steam at 15 pounds pressure on the square inch weighs 0.0387 pounds, and at 200 pounds pressure it weighs 0.42496 pounds. 3. How do you find out the horse power of an engine from the cylinder? *A.* Multiply the net area of the piston by the average effective pressure of steam acting against it; multiply the product by the piston speed in feet per minute, and divide this last product by 33,000, and the quotient will be the horse power. 4. How many pounds of steam is equal to a horse power? *A.* You cannot establish equality between pounds of steam and horse power. With some engines 20 pounds of steam per horse power per hour will be sufficient, while with others 40 pounds will be required. 5. What will prevent foaming in a boiler? *A.* It depends upon what causes the foaming. If from dirt, thorough cleansing will help it. If from insufficient boiler capacity, or a badly designed boiler, it will be difficult to deal with. 6. What can I put into a boiler to prevent the formation of scale? *A.* We do not know of anything that will prevent the formation of scale in a boiler without injuring the iron. Crude petroleum is sometimes used with good results. 7. How much steam will a 75 horse-power engine use working hard, with a boiler pressure of 80 pounds? *A.* The only way you can satisfactorily determine this is by weighing the water fed to your boiler. 8. How can I take the pound out of an engine that runs hot when keyed up? *A.* If the pound is in the connecting rod, and it runs hot except when left so loose as to pound, it is generally (if the pins are round) good evidence that the engine is out of line, and the remedy is to put it in line.

(2) A. A. C., Hopedale, Mass., asks: Will you give a short description of the *Eucalyptus Globulus*, also where it grows? *A.* This tree is indigenous to Australia and Tasmania, but has been extensively introduced into Southern Europe, and, to some extent, into this country, particularly in California and along the line of the Central Pacific Railroad. It grows to a great height, and its roots spread to a great distance. The leaves are used for medicinal purposes, and an essential oil is also obtained by their distillation, which is used in making perfumery and for other purposes. They have been at different times cultivated in low marshy localities, under the belief that their exhalations prevented miasma. It is now conceded, however, that the effect is due to the absorbing property of their roots.

(3) E. T., Kenosha, Wis., writes: I would like your opinion as to who is right: I claim that the water in a steam boiler cannot attain any higher temperature than the boiling heat, while my friend claims that the water in a boiler has the same heat as steam, regardless of steam pressure. If I am wrong, what prevents all the water from going into steam? *A.* The temperature of the water is the same as that of the steam. The reason why all the water does not become converted into steam, is that it is prevented from being so converted by the pressure of the steam. The temperature at which water boils varies with the pressure on its surface, and the temperature of steam varies with its pressure.

(4) A. J. D., Fort Wayne, Ind., calls attention to a misstatement in our answer to G. L. D., in issue of September 3. It occurs in an example which was given to illustrate the rule, and in no way affects the rule itself. In that example the length of lever should have been given as 30″ instead of 5 feet. We are obliged to A. J. D. for calling attention to it. He also asks if the diameter of screw should not be taken into consideration? *A.* Since the length of the lever is the distance from its end to the center of the screw, the diameter of the screw will make no difference except as it diminishes or increases friction.

(5) E. R. H., Boston, Mass., asks: 1. Will you please tell me what books I can get to study up nickel plating from? *A.* There are no books on nickel plating that we know of. 2. Are there any books or magazines published that make a specialty of nickel plating? *A.* No. 3. Is there a patent on the process? *A.* Yes.

(6) A. G. C., Chicago, Ill., asks for instruction for copying drawings by the blue print process. *A.* See answer to E. A. M., issue of July 3, 1880.

(7) F. H., Amherst, N.S., asks: What acid is used in a chemical fire extinguisher where bicarbonate of lime is used in the lower box? *A.* Muriatic, or sulphuric acid may be used.

(8) C. B., Susquehanna, Pa., asks: Can a set of gang saws for cutting lath be made to work successfully? *A.* It would be possible to cut lath with gang saws, but we hardly think it the best way.

(9) G.W. F., Pittsburg, Pa., asks: 1. Please tell me what size boiler to get for two cylinders for a steam yacht? The cylinders are 4″ x 4½″. *A.* Use a boiler with 5 feet of grate surface. 2. The place where the exhaust pipe bolts to the cylinder is too small for one pipe. Can I bolt another pipe to the other side of the cylinder and use two exhaust pipes instead of one? *A.* Yes; if the cylinders are constructed as we should suppose them to be, from your question. 3. What size boat and screw shall I use? *A.* Boat, 30 feet long and 6 feet beam. Screw with 3 blades, 28″ diameter and 42″ pitch.

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Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

James W. See, Consulting Engineer, Hamilton, O.

"Paragon" Metallic Piston Rod Packing. See AMERICAN MACHINIST, July 16th, 1881. Write for prices. A. Wilkinson, Manayunk, Philadelphia, Pa.

A New Treatise on Steam Engineering, Physical Properties of Permanent Gases and of Different Kinds of Vapor. By John W. Nystrom, C. E., 8vo., cloth. Price, $1.50, also A New Treatise on the Elements of Mechanics, Establishing Strict Precision in the Meaning of Dynamical Terms. By John W. Nystrom, C. E., 8vo., cloth, price. $2.00, Mailed by E. & F. N. Spon. 446 Broome St., New York City, on receipt of price.

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MANUFACTURES.

D. L. Love proposes to start a $50,000 cotton mill at Corinth, if the citizens will subscribe $7,000.

A $250,000 company has been formed to build a paper mill at Cornwall, Ont., to employ 100 hands.

Some skilled rolling-mill workmen at Niles, Ohio, propose to start a mill on the co-operative plan.

The new car manufactory at Cartersville, Ga., nas commenced business.

The Cleveland Car Works, says the Cleveland *Trade Review*, have orders that will keep them busy for two years.

Six thousand dollars have been subscribed to ward the erection of a chain factory in Monongahela City, Pa., leaving $4,000 more to be subscribed.

At Winston, N. C., a factory has been started for utilizing the dogwood and persimmon which abound in that section, and heretofore comparatively worthless. The article made is shuttles.

The largest single manufacturing industry in New Orleans is cotton seed crushing, produciug cotton seed oil, cake, meal, s ap-stock and soap. In average good years it pays $375,000 in wages, and turns out products of the value of $2,750,000.

A locomotive manufactory is to be started in Syracuse, N. Y. A company has been formed, and a building and some of the machinery have been purchased. The enterprise is said to be a large one.

The Backus Water Motor Co., of Newark, N. J., are about to open a branch office and wareroom in Chicago, where they propose to carry a stock of their motors to supply the growing demand from the West and Southwest.

The Atlas Engine Works, of Indianapolis, Ind., have placed one of their standard slide valve engines in the Cincinnati Exposition. It makes 225 revolutions per minute, furnishing power for electric lighting, and shows a remarkable result for regularity of motion, and perfect running.

A corporation has been organized in Saco, Me., called the "Winslow Beating-out and Shoe Manufacturing Company," for the manufacture and sale of machinery for the process known in the manufacture of boots and shoes as "beating out." The amount of capital stock is $150,000, all of which is paid in. Freeman Winslow, of Beverly, Mass., is President; Joshua R. Pearl, of Stoneham, is Treasurer.—*Boston Commercial Bulletin.*

E. E. Garvin & Co., 139 to 143 Centre Street, New York, have been manufacturing machine tools for upwards of three years. They have recently taken an additional floor as an addition to the shop, filling it with new and improved machinery, and are still pushed to fill orders. While in their shop recently, we noticed several machines boxed up to go to England. They employ about 80 men.

Nicholson File Co., Providence, R. I., are full of orders, and are now employing 350 hands. They are putting up a new brick building, 120 feet long by 38 feet wide, part of which will be two stories high, and also an engine and boiler house. They are about to manufacture some new specialties, which we will note more fully hereafter. When these specialties are placed upon the market they will inaugurate a new departure of considerable interest to the trade.

The public are accustomed to look for and find signs on about every business establishment. Occasionally, when viewing prominent buildings for the first time, as for instance the A. T. Stewart dry goods palaces, they are disappointed in not seeing a sign. Heretotore the Brown & Sharpe Manufacturing Co. have had no sign upon their large and attractive buildings in Providence, R. I., but now they have so far yielded to popular curiosity as to put a sign upon the edge of the roof, composed of iron letters four feet high, so that any traveler passing through the city on the railroad can at once distinguish the establishment, it being in plain view.

Hewes & Phillips' Iron Works, Newark, N. J., are very busy on orders several months ahead, among which are a number of the Allen high-speed steam engines. One of 300 H.P. is now being built for the Pennsylvania Steel Company, Steelton, Pa., and one of 100 H.P. has just been shipped to the Chicago Exposition to run the Brush electric lights, while numbers of various sizes are in course of construction for different sections of the country. They are also having a very large demand for their new iron planing machines and other machinists' tools, and are also exceedingly busy in their boiler department, having more orders ahead than they have had at one time for years.

It is evident that the Akron Iron Company must, at no distant day, materially enlarge their already extensive works in Akron. The demand upon this institution comes through their rapidly increasing business in their hot-polished shafting, on which particular kind of iron this company holds a patent, and which is becoming so popular throughout the entire country that the present facilities are far from adequate to meet the demand. A double force of men are kept working, so that the mill is now running day and night. A large amount of the hot polished shafting is now being used for silver mill stamp stems, in pounding gold and silver quartz in the Western mining districts, the sales of ore for this purpose amounting to hundreds of tons annually, and bidding fair to increase largely in the future, as the iron is just the thing required for the purpose, and far superior to anything heretofore used. The trade in hot-polished shafting, although comparatively of recent growth, has already spread throughout the entire United States, while leading cities of the Continent are large buyers. The mill is kept so busy on this one kind of iron, that orders for hundreds of tons of common bar iron have already been refused. At present a new polishing machine and a new engine are being placed in position, and will soon be in operation.—*Akron Beacon.*

Newly Incorporated Companies.

NEW JERSEY.

Rio de la Plata Telephone Company, Long Branch; Charles E. Hubbard, Peter Bentley and Tylee C. -Morford, corporators; Capital, $1,000,000. To construct, maintain and operate telephone lines in the cities of Buenos Ayres and Montevideo, and throughout the countries of Uruguay and the Argentine Republic, South America.

Penn Harrow Manufacturing Company, Camden; S. D. Sollers, M. R. Kirkpatrick, J. F. Tanner and T. E. Sollers, corporators; Capital, $600,000. To manufacture and sell the Penn harrow, and other agricultural implements and machinery.

Underhill Manufacturing Company, Franklin, N.J., and New York City; Fritz Achelis, John Achelis, Charles H. Reilly, and others, corporators; Capital, $30,000. To manufacture and sell hosiery, knit goods and woolen fabrics, etc., etc.

Gary Magneto Electric Company, Jersey City, N.J., and Boston, Mass.; Wesley W. Gary, John B. Taft, Geo. C. Hill and Levi L. Tower, corporators; Capital, $100,000. To purchase, use and sell, and to license others to use and sell, all inventions and patents relating to electricity and magnetism granted to Wesley W. Gary, and to make and sell all mechanical devices and appliances in connection therewith.

Thellen Jersey Syndicate, Jersey City, N. J.; Charles Siedler, Garret A. Hobart, H. R. Low, and others, corporators; Capital, $100,000. To build and construct railroads and other improvements in the States of New Jersey, New York and Pennsylvania.

United States Automatic Buttonhole Sewing Machine Company, Camden, N. J., and Phila., Pa.; D. Ramsay Patterson, Adam Warthman and Robert A. Sentman, corporators; Capital, $500,000. To manufacture and sell buttonhole sewing machines and buttonhole attachments, etc.

Warm Springs Consolidated Mining Company, Jersey City, N. J.; Henry C. Little, Benjamin S. Grant, Henry P. Brigham, and others, corporators; Capital, $1,000,000. To purchase, acquire, hold and develop mineral lands, etc.; situate in Warm Springs District, Idaho.

New York and Southern Railroad and Telegraph Construction Co., Jersey City; Chas. Wendell, Samuel R. Earle and Wm. H. Gray, corporators; Capital, $300,000. To construct and operate railway and telegraph lines in the States of Ohio, North Carolina, South Carolina, Virginia, West Virginia, Tennessee and Kentucky.

T. V. Allis Manufacturing Company, Trenton; T. V. Allis, F. W. Roebling, Clark Fisher, and others, corporators; Capital, $200,000. To manufacture and sell barbed, plain and ornamental fencing material, fence posts, wire rods, wire, steel, and all articles pertaining to fences, and machinery and apparatus for making the same.

Baltimore, Cincinnati and Western Construction Company, Jersey City; John O. Stevens, James H. Ledlie, George E. Horne, and others, corporators: Capital, $5,000,000. To build vessels, wharves, docks, piers, railroads for railway companies, and, more especially, to construct and equip the Baltimore, Cincinnati and Western Railway.

D. J. Wolfe Manufacturing Company, Greenville; D. J. Wolfe, Adolph Isaacsen and Levy Maybaum, corporators; Capital, $20,000. To manufacture and sell torpedoes, igniting tape, Chinese lanterns, and other goods, and the machinery and tools therefor.

Fork and Elevator Manufacturing Company, Unionville; Jacob R. Fitzhugh, John King and Mary B. Fitzhugh, corporators; Capital, $30,000. To manufacture and sell hay elevators, hay forks and other implements, etc.

Kansas and Eastern Railroad Construction Company, Jersey City; E. B. Phillips, Charles A. Rogers, S. D. Loring, and others, corporators; Capital, $500,000. To build, construct and equip the Leavenworth, Topeka and Southwestern Railway, and the Topeka, Salina and Western Railroad, in the State of Kansas.

MASSACHUSETTS.

Magneso-Calcite Fire Proof Company, Boston; Moody Merrill, Prest.; Sam'l Little, Treas. Capital, $500,000. For the manufacture of fire-proof fabrics and other articles; the purchase of patents and rights connected therewith, and the sale of the same.

Sanford Mills Company, Medway. Edward Eaton, Prest.; Orin A. Mason, Treas. Capital, $65,000. For the manufacture of cassimeres and other woolen goods.

ILLINOIS.

South Chicago Horse Railroad Company; principal office, Chicago: Charles M. Clark. Charles P. Burr and C. Worden Deane, corporators; Capital, $250,000. To construct and operate a horse and dummy railroad between points in the County of Cook.

South Chicago Railroad Company; principal office, Chicago; Wm. K. Ackerman, Benj. F. Ayres, Edward T. Jeffery, John C. Welling, Wm. J. Mawriac and John Dunn, corporators; Capital, $100,000. To construct and operate a line of railroad from a point on the line of the Illinois Central Railroad, between the stations of Hyde Park and Grand Crossing on said railroad, to the village of South Chicago.

Chicago, St. Paul and Omaha Railroad Company; principal office, Chicago; Geo. S. Bowen, P. F. Ward, Holmes Miller, L. D. Brady, Otis N. Shedd, Jas. L. Holden and Isaac N. Harden, corporators; Capital, $10,000,000. To construct and operate a line of railroad from a point within or near the city of Chicago to Freeport; thence, in a northerly direction along the valley known as the Pecatonica Valley, to an intersection with the north line of the State of Illinois, being about 140 miles in length. Also a line from a point upon the line above described, in the county of Du Page, in a southerly and westerly direction, to an intersection with the west line of the State of Illinois, being about 160 miles in length. In addition to said two main lines, it is intended to construct, as a part of said proposed railroad, ten (10) branch roads in different directions, aggregating in length about 180 miles.

Superior Barbed Wire Company, Chicago; Reuben Ellwood, Jas. F. Glidden, Jas. D. Lott and Hiram Ellwood, corporators; Capital, $100,000. For the manufacture and sale of barbed wire.

Hammell and Bonnell Proprietory Company, Chicago; Wm. H. Hammell, Chas. E. Bonnell and Chas. B. Orr, corporators; Capital, $50,000. For the manufacture and sale of proprietary goods, and other wares and merchandise.

Dry Amalgamating Company, East St. Louis; Giles Hall, Edward Blake and George Dean, corporators; Capital, $100,000. To manufacture, buy, lease and sell machinery and machines for mining purposes. To acquire and own the right of Hall's air blast dry placer and pulverized quartz gold and silver extracting and amalgamating machines, etc.

NEW YORK.

Mexican-Pacific Railroad Company. Directors Henry Sanford, Gardner Witherbee, Wm. R. Garrison and James B. Hawes, New York City; Isaac E. Yates and R. T. Colburn, Elizabeth, N. J., and John B. Frisbie, Mexico. Capital, $10,000,000. To construct, maintain and operate a railroad in the Republic of Mexico, extending from the City of Guaymas, in the State of Sonora, to such points on the Pacific coast as the Board of Directors may deem advisable.

Globe Button Company, Utica; Miles Mulligan, James Merriman and Patrick H. Carney, corporators; Capital, $8,000. To manufacture buttons, door and cabinet trimmings and ornaments, and other articles.

Redpath Marble Company, New York and Brandon, Vt.; Samuel Marsh, B. F. Cook and Thos. Winsor, corporators; Capital, $200,000. To quarry and manufacture marble in all its forms for commercial purposes, and to dispose of the same.

Krupp's Refrigerating Lubricator Company, New York; Herbert W. Foote, Wm. H. Benedict and Wm. V. Hilliard, corporators; Capital, $6,000. For the manufacture and sale of lubricating compounds.

The Ranken Sediment Arrester Company, New York; John H. Immen, Nelson Clements, John S Christie, O. H. La Grange and Walter I. Welch, corporators; Capital, $240,000. To manufacture and sell Ranken's improved attachment for surface condensers.

Machinists' and Engineers' Supplies.

NEW YORK, Sept. 15, 1881.

The general state of the supply market remains unchanged, but there are numerous complaints from dealers who are unable to get their orders filled.

Although iron pipe has not advanced since our last report, yet the manufacturers are driven far beyond their capacity.

Machine tools continue scarce, and the manufacturers are unable to catch up with their orders.

The demand for rails is increasing, with prices unchanged.

Machinery and tool steel is in greater and increasing demand.

The same is true in regard to all kinds of merchant steel.

Iron and Metal Review.

This week the demand for Foundry Irons is active, some of the best brands being obtained with difficulty. Although the demands for Forge Irons are not very active at present, yet the active consumption of large quantities will compel more purchases to be made before long. Prices remain unchanged, as follows: Foundry No. 1, $24.50 to $25; Foundry, No. 2 X, $22 to $22.50; Gray Forge, $21. There have been large sales of foreign irons in this market during the past week, principally of the higher grades. We hear of several sales of Gartsherrie at $23.50, but the general quotations are unchanged, as follows: Coltness, $23.50 to $24; Eglinton, $21; Glengarnock and Gartsherrie, $22.50 to $23. In steel and iron rails there is considerable inquiry, and we are informed that several contracts for steel rails have been taken for fall delivery at $62 per ton from the mill. Iron rails, we are told, are selling at $50.25, delivered in this city. Old T rails are in fair demand, and the market strong. Prices remain same as last reported. Inquiry for wrought iron scrap is active with prices unchanged. Copper has greatly improved, and prices have advanced, and are quoted from 17¼c. to 17¾c. A still further advance may be expected. Straits Tin, 21¼c.; Australian, 21⅜c.; Billiton, 21¼c.; English Refined, 21½c.; Common English, 21¼c. to 21⅜c.; Banca, 24c. to 24½c. Lead—Refined, 5¼c. to 5⅜c.; Common do., 5⅛c. to 5¼c. Western Spelter is quoted at 5c. to 5⅛c.; Silesian, 5¾c. Antimony, 14½c. to 15c.

WANTED

Wanted—A partner in the Machine business, Active or Silent. Would join some establishment now in operation. Have had 30 years' experience in England and the States. Also, I possess a quantity of small tools suitable for a general business. Would take the working part of the business myself. Address J. H., 113 Randall St., Baltimore, Maryland.

Manufacturers wishing to secure the services of a thorough practical Machinist and Tool Maker, who has had large experience as Contractor and Superintendent where rapid, cheap and fine interchangeable work was produced, is also competent to organize and construct special tools and machinery for same, is now open to an engagement. Best references. Address BOX 1, AMERICAN MACHINIST, 96 Fulton Street, N. Y.

Wanted—5 Machinists, men accustomed to setting up machinery preferred. Also 5 good moulders. Address, D. J. Murray, Wausau, Wis.

Mechanical Draughtsman, Technologicaly educated, with some years experience, desires engagement. Address, Swede, 109 Main St., Hartford, Conn.

Position as Superintendent by a well-known and experienced Machinist and Designer, who is now occupying a similar position. Established reputation and first-class references. Address, SUPERINTENDENT, AMERICAN MACHINIST Office, Box 14.

A thoroughly competent and experienced steam engineer wants a situation of responsibility, with compensation corresponding to the degree of service rendered. Can furnish every required evidence of ability and reliability. Address, "Chief Engineer," office AMERICAN MACHINIST.

Wanted, by a boy of 17, a position to learn the machinist's trade. Address, stating terms, salary, &c., Joseph E. Murphy, Hastings-on-Hudson, New York.

BLACKIE'S DRAWING BOOK.

A complete course of instruction for the practical engineer, comprising Linear Drawing, Projection, Eccentric Curves, Gearing, Sketching from Machines, Projection of Shadows, Tinting and Coloring. Illustrated by seventy-one plates. Complete in 16 parts, $12.00, or strongly bound in half-morocco, $17.00. Sent free by mail or express on receipt of price. Will instruct without a teacher.

E. & F. N. SPON, 446 Broome St., N. Y.

FOR SALE BY THE

HEWES & PHILLIPS IRON WORKS,

NEWARK, N. J.

1—100 H. P. Horizontal Automatic Cut-off Engine Cylinder, 17"x42" new.
1—20 H. P. Horizontal Plain Slide Valve Engine Cylinder, 9"x12" new.
2—15 H. P. Horizontal Plain Slide Valve Engine Cylinder, 6x12' new.
1—14"x15" Steam Air Compressor, New.
1—16x16 Belt " " "
1—Woodward Steam Fire Pump 3½ Suction.
2—1½" discharge, 2d Hand.
1—Woodward Steam Fire Pump, 5" Suction.
2—2½" discharge Pipes, 2d Hand.
1—No. 1 Niagara Pump, 2d Hand.
1—Double Nut Tapping Machine, New.
1—Veneer Knife Grinding Machine, capable of grinding convex, concave or straight, very heavy and substantial and calculated for fine work.
1—Improved Car Axle Lathe.
1—57 H. P. High Speed Allen Engine.
1—70 " " " " "

NEW ENGLAND MANUFACTURERS' GREAT FAIR.

Opened August 18, 1881.

APPLICANTS FOR SPACE

are respectfully requested to reduce as much as possible the amount applied for in order that Exhibitors who have not specified their requirements may not have their applications for space rejected.

R. C. GRAVES, Agent,

Office, 5 Pemberton Square, Boston, Mass.

THE

Slate Sensitive Drill.

Adapted to rapid work with small drills. Its extreme sensitiveness prevents clogging and breakage of drills. Has a swinging table with attachment for center drilling. Instantly adjustable to different lengths of work. Over 200 already in use. Send for circular.

DWIGHT SLATE,

HARTFORD, CONN.

TOOLS.

Machinists, Engineers, Model Makers

and all classes of Mechanics can find TOOLS to suit them at

184 to 188 WASHINGTON STREET,

BOSTON, MASS.

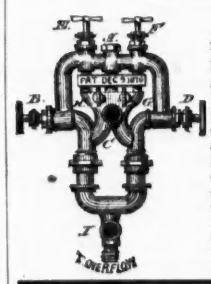
A. J. WILKINSON & CO.

CATALOGUES FREE.

T. NEW'S PREPARED ROOFING.

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 38 John Street, New York.

HOGUE'S GRADED INJECTOR.



Our Improved Graded Injector is the best lifter in the world. Can not be stopped by sediment. We challenge any or all Injectors or Pumps to compete with us. Is manufactured upon an entirely new principle. We also manufacture a machine for lifting only. Both machines can be graded to the quantity desired. Send for circular and full information to

MACDONALD & HOGUE, M'f'rs,

Sandy Lake, Pa.

Patent Binder for the American Machinist,

$1.00 EACH BY MAIL OR EXPRESS.

Engines for Sale.

One new 14x24, slide valve. One second-hand 16x32 12x24, 12x20, 10x20, 9x16 portable, 9x14, 8x14, 6x12, and many others. A full line of good second-hand Iron and Wood Working Machinery. A complete stock of Shop and Mill Supplies. Special western agents for Knowles Steam Works, also for the Tanite Company's Emery Wheels and Grinding Machinery. Our new Steam Jet Pump is the most reliable made; send for circular.

J. H. KERRICK & CO., Indianapolis, Ind.

ELECTRIC LIGHT APPARATUS.

A MACHINE AND LAMP COMPLETE for *Two Hundred Dollars*. Gives one light rated at 2,500 candles. In other words will light a space 150 feet square so that this advertisement can be read easily. Requires about 1½ horse power. Only ordinary intelligence required to run it. Full instructions with each machine. Send for Circular.

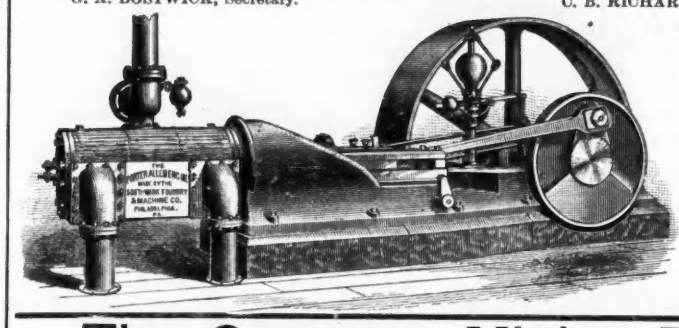
BRADY MF'G CO.

Manufacturers of Electric Light Apparatus, Emery Machinery, &c.

257 & 259 Water Street, Brooklyn, N. Y.

THE PORTER-ALLEN HIGH SPEED ENGINE.

W. H. MERRICK, President and Treas. C. T. PORTER, Vice-President.
G. A. BOSTWICK, Secretary. C. B. RICHARDS, Superintendent.



THE SOUTHWARK FOUNDRY & MACHINE CO., Philada., having largely increased its facilities is now prepared to fill all orders for the Porter-Allen Engine on contract time.

Orders solicited for Iron and Brass Castings in the rough.

Address the Company, 430 Washington Avenue, Phila., Pa.

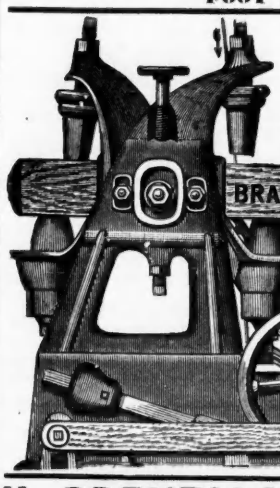
The Cameron Mining Pump,

Designed for use in Gold, Silver, Coal and Iron Mines. Also for general Manufacturing and Fire purposes.

Pumps furnished with movable linings in iron, composition or Phosphor Bronze.

THE A. S. CAMERON STEAM PUMP WORKS,

FOOT EAST 23d STREET, NEW YORK.



BRADLEY'S CUSHIONED HAMMER

STANDS TO-DAY WITHOUT AN EQUAL.

It approaches nearer the action of the smith's arm than any hammer in the world.

Bradley & Company,

SYRACUSE, N. Y.

[Established 1832.]

H. PRENTISS & COMPANY,

No. 42 Dey Street, New York.

P. O. BOX 3362.

DEALERS IN MACHINISTS', MANUFACTURERS' AND RAILWAY

Tools & Supplies.

KEARNEY & FOOT

WORKS AT PATERSON, N. J.

FILE MANUFACTURERS,

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On every package of Files we print the following statement:

"Should a file be defective, by taking it to the party from whom purchased, a perfect one will be given in exchange free of charge."

COOKE & CO., FORMERLY COOKE & BEGGS,

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The Waters Perfect Governor,

Having Adjustable Speed, Automatic Safety Stop, Sawyer's Lever, and Solid Composition Valves and Seats.

ALSO,

SUPPLIES

For Machinists, Railways, Mills, Mines, &c.

Please send for circular and state that you saw the advertisement in this paper.

STEWART'S READY ROOFING

For STEEP and FLAT ROOFS of all kinds; can be applied by ordinary workmen at ONE THIRD the cost of TIN. Send for a sample and our circular which gives full directions how to apply your own roof; also how to repair leaky roofs of all kinds. Address,

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Manufacturers of

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18" ENGINE LATHES.

A FIRE-PROOF NON-CONDUCTOR OF HEAT AND SOUND.

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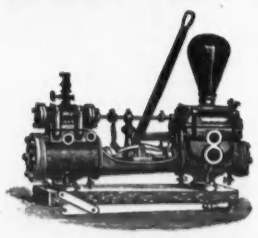
Price, 1 Cent Per Lb.

Knowles' Improved Steam Pumps,



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OF ALL KINDS.